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**REPORT AND PRELIMINARY RESULTS OF
R/V POSEIDON CRUISES P 366-1 AND P 366-2,
LAS PALMAS - LAS PALMAS - VIGO, 03 -19 MAY 2008 AND 22 -30 MAY 2008.
PERGAMOM PROXY EDUCATION AND RESEARCH CRUISE
OFF GALICIA, MOROCCO AND MAURETANIA.**



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R/V POSEIDON

Cruise Report P366-1/2

PERGAMOM

Proxy Education and Research cruise off
Galicia, Morocco and Mauretania

Las Palmas - Las Palmas - Vigo

3 – 19 Mai 2008, 22 - 30 Mai 2008



Cruise within the framework of the DFG/NWO financed international Graduate College:
EUROPROX: "Proxies in Earth History"

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1. Participants

P366-1

Name	Discipline	Institution	Nationality
Kasten, Sabine	Geochemistry, chief scientist	AWI	D
Zonneveld, Karin	Micropalaeontology, co-chief	GeoB	NL
Bogus, Kara	Geochemistry	AWI	USA
Haarmann, Tim	Geochemistry	AWI	D
Meyer, Inka	Sedimentology/Dust	GeoB	D
Michel, Julien	Carbonate facies	GeoB	F
Raitzsch, Markus	Micropaleontology	GeoB	D
Stuut, Jan-Berend	Sedimentology/Dust	GeoB	NL
Thal, Janis	Geochemistry	GeoB	D



Figure 1. Cruise participants of Leg P366-1

Name	Discipline	Institution	Nationality
Zonneveld, Karin	Micropalaeontology, chief scientist	GeoB	NL
Baumann, Karl-Heinz	Nannoplankton	GeoB	D
Barke, Judith	Palynology	UU	D
Fink, Christina	Nannoplankton	GeoB	D
Fraile-Ugalde, Igaratza	Modeling	GeoB	E
Gianluca, Marino	Palynology	UU	I
Hoins, Mirja	Historical Geology	GeoB	D
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Figure 2. Cruise participants of Leg P366-2.

2. Research objectives.

The Poseidon Cruise PERGAMOM: “Proxy Education and Research cruise off GALicia, MOrocco and Mauritanía” has been carried out within the scope of the International Graduate College EUROPROX (Proxies in Earth History) that is funded by the German and Dutch science foundations DFG and NWO. Within this college, marine scientists from the Universities of Bremen, Utrecht, Amsterdam, Newcastle, Paris, Southampton, the Alfred Wegener Institute for Polar and Marine Research in Bremerhaven and the Massachusetts Institute of Technology join their know-how as well as their scientific and educational resources within a joined scientific program. The central theme within this program forms the development, testing and improvement of so called “proxy parameters” and “proxy methods” in marine research which allow the accurate reconstruction of paleoceanographic, paleoclimatic and paleoenvironmental conditions from marine archives.

To date, there is an intense discussion among scientists, economists and politicians on the relative importance of natural climate forcing. Key issues regard the interactions between oceans and atmosphere, especially the exchange of CO₂ and heat, and the implications of changing oceanic circulation, chemistry, and life. To unravel this complex interaction and to obtain insight into the nature of positive and negative feedback mechanisms, detailed and quantitative information is required about individual control parameters. While direct observations only exist for the last decades, so called “proxy records” that are derived from isotopic, fossil, chemical and physical properties of marine sediments, reach back millions of years. These describe past variations of e.g., global ice volume, sea surface temperature (SST) and salinity, nutrient availability, marine and terrestrial material fluxes, oxygenation and productivity of the oceans. For a sound application of proxies it is essential to obtain insight in the usability and limitations of them. To achieve this, information on the basic processes that control the various proxies is required and it is essential to test, adapt, and further develop the proxies. Expanding the range and reliability of proxy methods is an obvious and important world-wide research topic.

The study area of leg P366/1 - the Moroccan and Mauretanien shelf and slope between Cape Yubi and Cape Timiris - which is characterized by strong gradients and temporal variability in coastal upwelling and Saharan dust input represents an ideal site to study the influence of terrestrial and marine input as well as early diagenetic processes on the formation and preservation of various sedimentary proxy signals. For this purpose dust collectors, a rosette water sampler and CTD, in-situ pumps, a multicorer, a gravity corer, a sediment grab, a multi net and a hand net were deployed (1) to trace the transport of particulate material from the atmosphere, through the water column and towards and into the sediment, and (2) to identify and quantify the preservation and diagenetic overprint of various organic and inorganic sediment components under and in various geochemical conditions and environments (Table 1).

Cruise P366-2 had apart from a scientific purpose, a strong educational character and provided research students, doctorates of the granted 3rd phase of the EURPROX project (2008-10) with skills, materials and data for joint multi-proxy studies and engaged our 2 PostDocs in cruise planning and logistics.

The transect from the Canary Islands to Galicia crosses ocean currents and frontal systems that influence the production of planktic foraminifera, coccolithophores, acantharia and dinoflagellates (Figure 2, Table 1). The local physical conditions of the water column have strong influence on the chemical, elemental and isotopic composition of the calcareous shells of planktic foraminifera, coccoliths and calcareous dinoflagellate cysts. Research activities focussed on:

1. Determining the relationship between upper ocean oceanographic conditions and the lateral and vertical distribution within the water column of the above mentioned groups of organisms as well as the relationship between the physical properties of the water column with chemical, isotopic and organic geochemical composition of calcareous fossilisable remains of these organisms.
2. To identify and quantify possible alteration of the initial proxy signals in the water column and in the upper sediment in relation to transport and diagenetic processes. For this purpose, a rosette water sampler and CTD, in-situ pumps, a multicorer, a gravity corer, a Van Veen sediment grab, a multi net and a hand net were deployed. Apart from this a dust sampler has been deployed to obtain information of the atmospheric dust load of open oceanic sites.

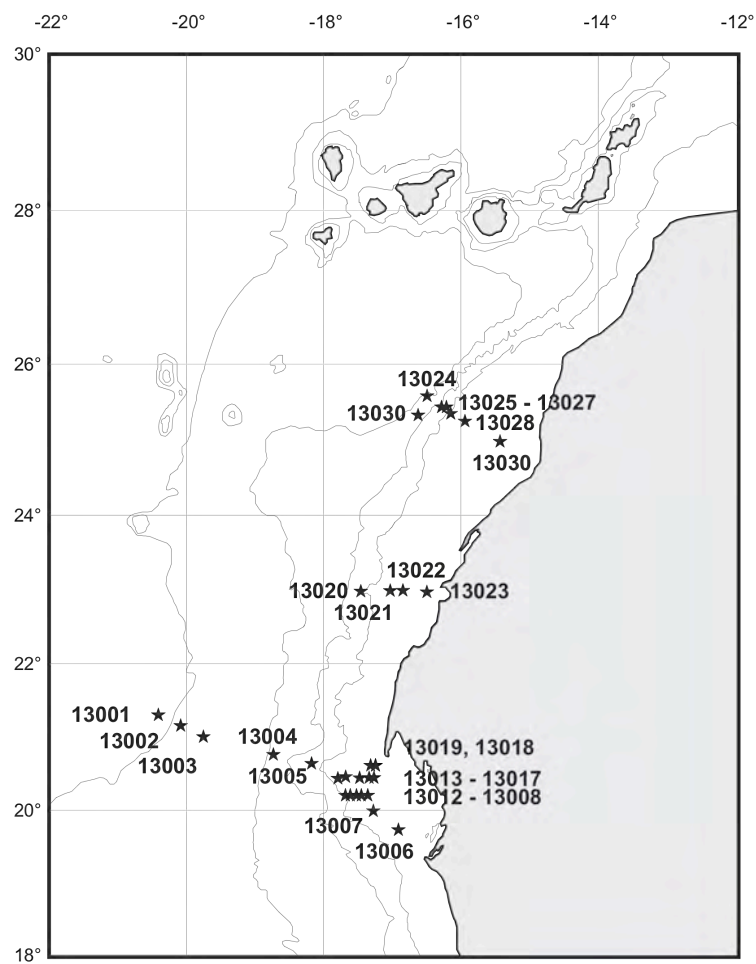


Figure 3. Sample positions of Leg P366-1.

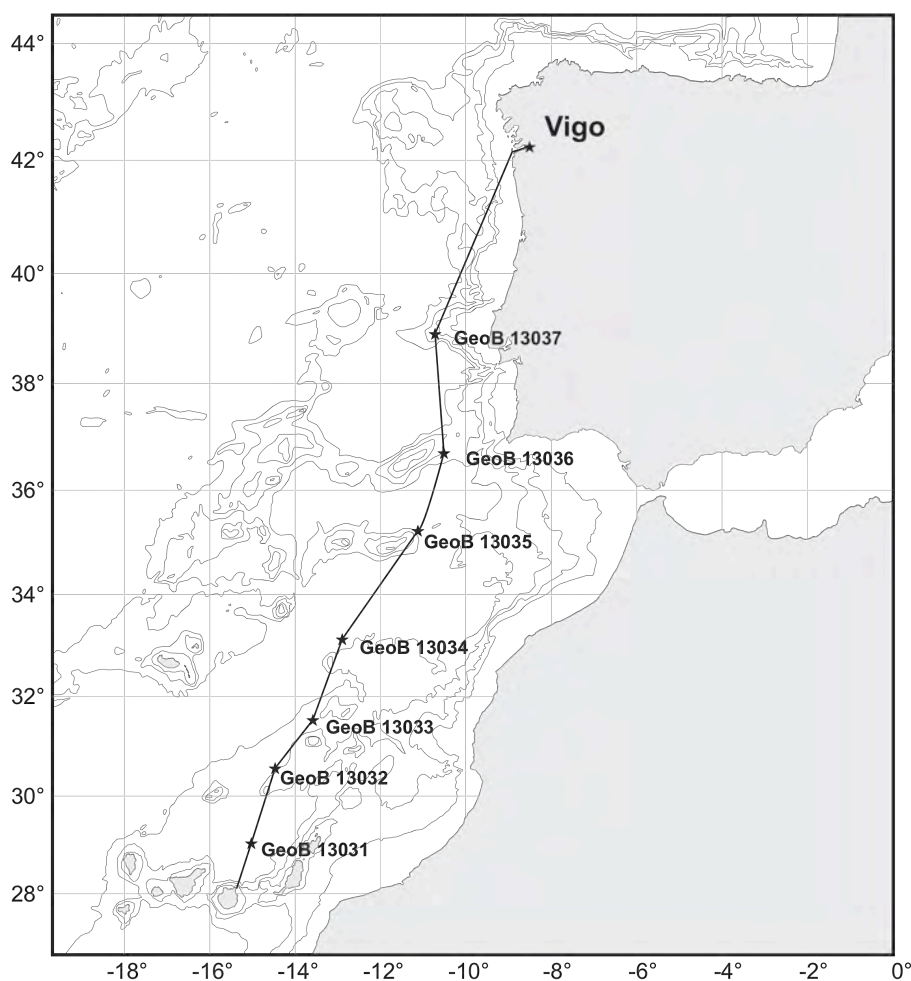


Figure 4. Cruise track and sample positions of Leg P366-2

3. Scientific program

3.1 Leg P366-1: Moroccan and Mauritanian margin between Cape Yubi and Cape Timiris

The region between Cape Yubi and Cape Timiris is one of the most productive regions on Earth as result of the presence of coastal upwelling and the year round terrestrial dust input that delivers trace elements such as iron and phosphorus to the ocean that act as fertilizers increasing primary ocean production (e.g., Kolber et al., 1994). Due to its position directly north of the northernmost extension of the Intertropical Convergence Zone ITCZ, the region is the present-day location of the major Saharan dust plume to the Atlantic Ocean. The coastal upwelling is related to the strength of the North-East trade winds, the prevailing winds in the region. Climate change related variability in atmospheric circulation alters the rate on export productivity in the region that in turn can influence climate.

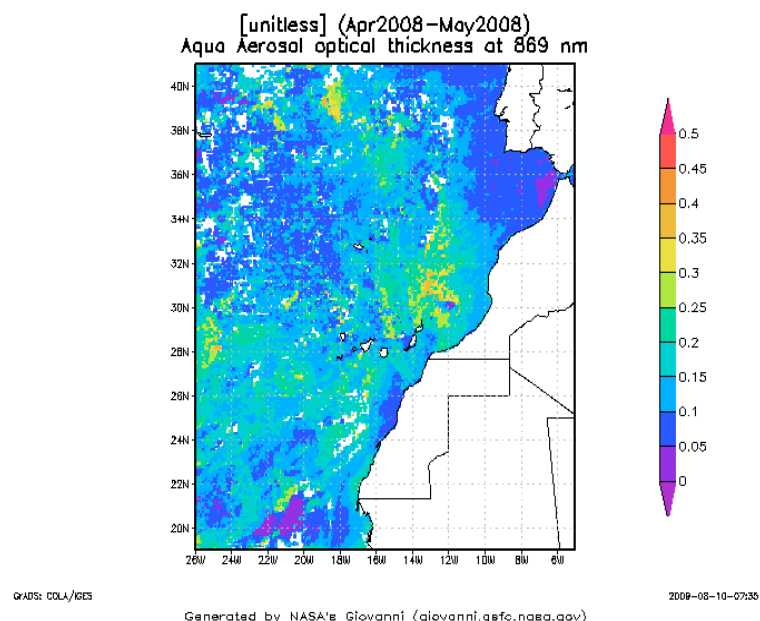


Figure 5. Aerosol optical thickness reflecting dust content of the atmosphere.

(Source: Giovanni.gsfc.nasa.gov).

To date the relationships between terrestrial input, marine productivity, storage of organic carbon in marine sediments and (past) variations in climate are not entirely clear. To gain deeper insight, it is essential to trace and characterize present and past terrestrial input, quantify past marine export production and estimate the rate of alteration of the initial signals by diagenetic processes. During cruise P366-1, scientists from several disciplines combined their analytics to test and validate sedimentological, geochemical and micropalaeontological proxies that promise insight in these relationships. The main focus of the program was threefold: (1) Investigating the rate and composition of terrigenous input in the research area, (2) Obtain insight in the distribution of terrestrial-derived particles in the research area, the effect on the marine ecosystem and the alteration of the terrestrial and corresponding marine signal by diagenetic and sedimentological processes, (3) Obtain insight in processes at the sediment/water-interface that modify the initial signals.

(a) Rate and composition of terrigenous input in the deep sea

Continental climate histories can be derived from the terrigenous portion of marine sediment sequences. By combining different climate indicators such as the grain-size distributions, chemical composition, mineralogy or biogenic compounds, the hydrological conditions in potential source areas; wind patterns, transport processes and intensities can be reconstructed (Wagner et al. 2004, Zabel et al. 2004, Stuut et al. 2002, Schefuß et al. 2005). To interpret continental climate records of marine sediments accurately, we must have a quantitative understanding of the source and distribution processes. During cruise P366-1 eolian particles have been collected by dust-collectors to obtain information about their chemical, sedimentological and palynological characteristics. The distribution of eolian and fluvial particles has been investigated by sampling upper ocean waters with help of in-situ pumps and a rosette water sampler system.

(b). Relationship between terrestrial input and the marine ecosystem, alteration of terrestrial and marine signals by diagenetic and sedimentological processes in the water column.

Input of terrestrial particles has a major influence on the marine system. For instance the input of nutrients and trace elements enhances marine bioproduction. Within the EUROPX project several research activities focus on proxies that provide information about past changes in the

rate and character of terrestrial input as well as on past variability in marine productivity. For an accurate understanding and validation of these proxies it is essential to obtain insight into the alteration processes that affect the primary signal during the long-range transport from continental sources to sea floor sinks. Significant dissolution and remineralization of the mineral fraction takes place in the water column; the organic part is microbially degraded leaving only intensely altered, hardly degradable, residual matter (e.g. Oriens and Bruland 1985, Wakeham et al. 1997, Minor et al. 2003). There is clear evidence that the time from the input to final (hemi)pelagic deposition of particulate material takes up to several thousands of years (Inthorn et al. 2006a). The preservation potential of the different organic components varies largely as shown by major differences in radiocarbon ages on TOC-, alkenones and carbonate samples from different water depth intervals (Mollenhauer et al. 2003, 2006).



Figure 6. In-situ Pump sampling. (photo: Janis Thal).

Sediment and sediment-trap studies suggest that biogenic barium/barite concentration and the organic-walled dinoflagellate cyst association in marine sediments can be used as proxies for past variations in productivity. However, the exact mechanisms behind the formation of barite in the water column, which is undersaturated with respect to this mineral is still a controversial debate and the utility of the dinoflagellate cyst association is complicated by the recent finding, that some species are extremely resistant against aerobic degradation whereas others are vulnerable (e.g. Bernstein et al. 1992, Bernstein and Byrne 2004, Dymond et al. 1992, Francois et al. 1995, Ganeshram et al. 2003, Hopkins and McCarthy 2002, Zonneveld et al. 1997, Zonneveld et al., 2001). Within the fossil records sedimentary Ba enrichments might originate directly from increased productivity, can have been diagenetically precipitated within the sediment slightly above the sulfate/methane transition (SMT), or might be the result of massive inputs of dissolved Ba from decomposing gas hydrates enhancing barite formation rates (Dickens et al. 2003, Torres et al. 1996). As the sulfur isotopic composition of sulfate in the water column ($\sim +21\text{‰}$; Paytan et al. 2002) is significantly lighter than in pore water at the SMT ($\sim +40\text{‰}$; Torres et al. 1996), it is generally assumed that the $\delta^{34}\text{S}$ of barite should give insight into the formation mechanism or origin (Paytan et al. 2004). As barite – irrespectively of its origin – will be dissolved under sulfate-depleted conditions. The discovery of Riedinger et al. (2006) of pronounced authigenic barite enrichments preserved in sulfate-depleted sediments below the Benguela upwelling area, indicates that there is still a lack of knowledge with respect to: (1) possible pathways of barite formation in the water column, (2) the role of dissolved barium concentrations for the rate of barite

precipitation, (3) the factors controlling the sulfur isotopic signature of barite, and (4) the conditions and/or mechanisms determining the long-term preservation of sedimentary Ba enrichments. The study of sediment trap data might provide insight in these questions. Unfortunately the availability of such data is extremely limited (Paytan et al. 2002).

With respect to dinoflagellate cysts it was recently found that the accumulation rates of resistant species in surface sediments vary with chlorophyll-a concentrations in upper waters (Zonneveld et al. 2007a). So far, this empirical relationship has not been tested in field studies directly relating the production of these cysts with total export production. Only a few sediment trap studies exist to date that document dinoflagellate-cyst accumulation over shorter periods (Dale and Dale 1992, Harland and Pudsey 1999, Zonneveld and Brummer 2000, Godhe et al. 2001, Morquecho and Lechuga-Devéze 2004). As the plankton association might change considerably from year to year it is essential to obtain a cyst-flux recovery over a longer time span (Smayda and Reynolds 2003).

(c) Proxies for aerobic degradation rates and bottom water oxygen concentrations.

Diffusion-limited selective aerobic decay of organic matter, often referred to as “burndown”, can severely modify the primary sediment composition (Dauwe et al. 2001). It has been suggested that the degradation rate of a given concentration of a labile organic matter component G can than be expressed as $dG/dt = -kG$ where t is the reaction time and k is the first order decay constant (e.g. Hedges and Prahl 1993 and references therein, Cowie et al. 1995, de Lange 1998, Prahl et al. 2003) yielding an exponential decay law $G_t = G_0 \exp(-kt)$. However, it has been discovered that several parts of the organic matter fraction such as certain organic biomarkers and dinoflagellate cyst species degrade according to higher order equations (Versteegh and Zonneveld 2002). The bottom water oxygenation appears to be also expressed in the degradation rate of refractory organic dinoflagellate cysts (Zonneveld et al. 2007a). Degradation rates of organic walled dinoflagellate cysts may form a suitable proxy to reconstruct past ocean bottom water conditions and as such add information to studies on deep ocean ventilation.

3.2 Leg P 366/2. Oceanic transect from the Canary Islands to the Galician shelf

The surface currents and frontal system in the research area are characterized by a large variability in temperature, salinity, turbulence and nutrient conditions as well as by different elemental and isotopic compositions. The main oceanographic features consist of the southward flowing Portuguese and Canary Currents. Seasonal upwelling can be observed along the Portuguese margin.

Several projects within EUOPROX focus on proxies based on calcareous microfossils. Their isotopic composition serves frequently as backbone for paleoceanographic reconstructions. A growing number of important proxies derive from the trace-element composition of foraminiferal shells (e.g. Lea 1999). Past environmental conditions can also be estimated by quantifying differences between modern and fossil assemblages of planktonic foraminifera species (e.g. Malmgren et al. 2001). However, this estimation is complicated by the individual ecological needs of the employed foraminifera species (Murray 1991), which are not entirely clear yet (King and Howard 2003). To clarify relationships between isotopic and elemental compositions of foraminiferal shells and their living condition, more information is required about the ecology of individual species (Wilke et al. 2006).

Calcareous phytoplankton groups such as calcareous dinoflagellates and coccolithophores have a long fossil record and play a unique role in the global carbon cycle (Thierstein and Young 2004, Hildebrand-Habel and Willems 2000). Although increasing information is available on their distribution in the surface sediments and their ecologic control (e.g. Hagino et al. 2000, Vink

2004), this information is restricted to a few regions only. As result there is a shortage of suitable studies on natural populations. For the Canary Islands region this knowledge is limited to mainly seasonal and interannual fluctuations in coccolithophore fluxes, including species composition and abundance, as well as the timing and intensity of coccolithophore production periods (Sprengel et al. 2002). Plankton studies are limited to single species. For calcareous dinoflagellates only one study documents the depth habitat of one single species (Karwath et al. 2000).

Calcareous nannofossils and dinoflagellates can provide indicators of past climatic and oceanographic conditions from both the organic and inorganic remains in the sediments. The chemistry of the organic biomarkers from coccolithophores has been widely used in paleoceanographic studies (Eglington et al. 2001), whereas the deliberate selection of inorganic (coccolith, dinoflagellate) carbonate for elemental and stable isotopic analysis is a relatively recent paleoceanographic strategy (Friedrich and Meier 2003, Zonneveld 2004, Zonneveld et al. 2007b). Further calibration studies are required to increase confidence in their paleoceanographic application.

4. Dust sampling

Jan-Berend Stuut and Inka Meyer

Terrigenous sediments deposited in marine sediments in the (sub)tropical oceans are a mixture of a pelagic component brought in by the wind and a hemipelagic component brought in by rivers and supplied from the shelf. The analysis of eolian dust allows the estimation of aridity in eolian source regions and the intensity of the transporting winds through grain-size measurements, so they can be used to reconstruct changes in continental climate.

For validating the terrigenous sediment fraction in marine sediment cores, present-day dust samples were collected during the Poseidon cruise POS 366-1 (03/05-19/05/2008, Table 2).

The collecting was done with two dust collectors which were placed on the observation deck. An engine inside both dust collectors sucks the surrounding air. This air passes through a filter on which the dust is caught. The dust-collectors are connected with a windvane to prevent particles from the ship's chimney to contaminate the filters. This way, the wind direction that is to be sampled can be selected, only wind from up front was sampled. As soon as the relative wind direction was from behind, the dust collectors were automatically switched off.

Two kinds of filters are used for several investigations. The glass-fibre filters are for analysing the organics in the dust, while the cellulose filters are used for grain-size measurements, chemical and mineralogical analyses. Sample point and filter types are given in Table 2.

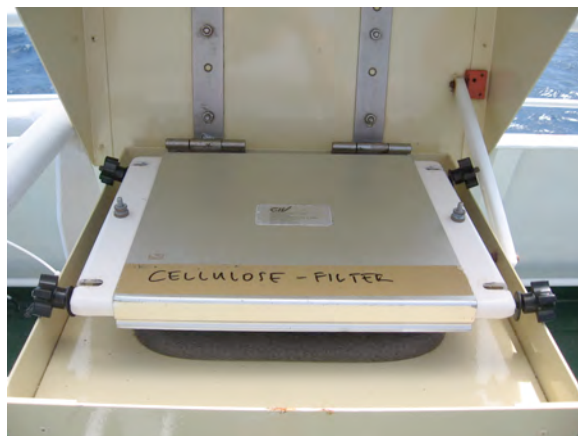


Figure 7. Dust samples with cellulose filter (photo: Inka Meyer).

5. Water column sampling

Karin Zonneveld

To unravel the complex interaction between changing oceanic circulation, chemistry, life and climate change and to obtain insight into the nature of positive and negative feedback mechanisms, detailed and quantitative information is required about individual control parameters. While direct observations only exist for the last decades, so called “proxy records” that are derived from isotopic, biological, chemical and physical properties of marine sediments, reach back millions of years. For a sound application of proxies it is essential to obtain insight in the usability and limitations of them. To achieve this, information on the basic processes that control the various proxies is required.

A considerable part of the presently used proxies are plankton based as well as based on land derived organic and anorganic components. The narrative of the water sampling program of cruise P366-1 was to determine the environmental characteristics of the water column that might influence and/or alter initial proxy signals and to determine the environmental characteristics of the depth habitat of individual proxy related plankton groups. The proxies of focus are terrestrial derived dust and pollen/spores input, organic-matter production in the upper water column and those proxies that are based on planktic foraminifera, calcareous cyst producing dinoflagellates, organic-walled cyst producing dinoflagellate cysts and acantharia. Sample position and nature of samples are given in Table 3.

During cruise P366-2 the scientific activities focussed on the achievement of information about the depth habitat and ecology of the above mentioned plankton groups as well as coccolithophorids (Table 3). For this the local environmental, physical and oceanographic conditions of the water column will be compared to the lateral and vertical distribution patterns of the plankton groups in the water column. Furthermore the geographic distribution of land derived

particles in the upper water column and upper sediments will be compared to the ocean current system.

Organic and inorganic components from terrestrial origin can be transported into the marine system by wind and rivers. In the study region wind transport forms the major transport mechanism by episodically transporting large amounts of particles into the upper water column. Recent studies have revealed that these particles are most probably not transported down through the water column immediately but that there are several layers within the water column where these particles remain in suspension. It is suggested that the residence time of these particles within these so called nepheloid layers might be up to several thousands of years. For adequate subsampling of these layers with the help of in-situ pumps and a Rosette containing 18 Niskin bottles (10 l volume), the temperature, density, chlorophyll and oxygen differences of the upper 600m of the water column was determined using a CTD (seabird 911+).

Foraminifera have been most widely used as a basis of isotopic and elemental derived proxy source due to their common abundance in the sediments and the ease in which monospecific samples can be isolated from these sediments. However, biological factors such as the migration of several planktonic species through different water masses can hamper the interpretation of these signals. Consequently, detailed information about the isotopic and elemental composition of the water column between 500 and 0m as well as factors that influence these parameters such as pH and alkalinity have to be determined.

Recent studies for the use of primary producers such as the photosynthetic dinoflagellate cyst *Thoracosphaera heimii* give promising results (Zonneveld, 2004; Zonneveld et al., 2007b). Cysts can relatively easily be isolated from sediments. Calculated temperatures based on the palaeotemperature equation for inorganic calcite precipitation generally reflect mean annual temperatures at the thermocline (Deep Chlorophyll Maximum) depths, which is suggested to represent its preferred depth habitat (Zonneveld, 2004). To obtain information about the depth habitat of this species in the research areas water samples have been collected throughout the upper 150 m of the water column with special focus of the layers in and around the deep chlorophyll maximum. Large water samples were collected at the maximum abundance depth of *T. heimii* to determine the isotopic and elemental composition of the cyst shells as well as the isotopic and chemical properties of the water column.



Figure 8. Cyst of *Protoperidinium conicum*

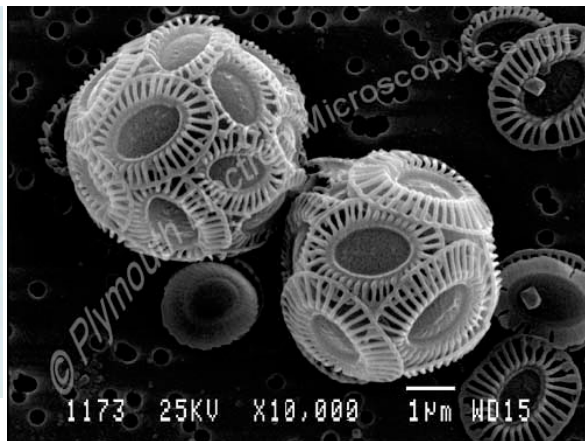


Figure 9. *Emiliana huxleyi* (Photo Plymouth centre)

Organic-walled dinoflagellate cysts are widely used for stratigraphic and environmental studies. During the last decade it became clear that some cysts are extremely resistant against diagenesis while others are extremely vulnerable. There exists a strong relationship between the oxygen concentration in bottom and pore-waters and the degradation rates of these vulnerable

species. To obtain information about potential degradation of the species in the water column detailed information is gathered about the oxygen concentration in the complete water column.

Phytoplankton at the base of the marine food chain serves as an essential key to understanding both marine ecology and biogeochemistry. Coccolithophores, marine unicellular, flagellate algae (Prymnesiophyceae), are the predominant group of calcifying marine phytoplankton. They have the best fossil record of all phytoplankton and play a unique role in the global carbon cycle as one of the major primary producers in today's oceans. Coccolithophores are characterized by calcareous scales (coccoliths), which surround the cell of a coccolithophore and form an extracellular covering (coccosphere). In general, coccolithophorid species show distinct biogeographic distribution patterns, defining broad latitudinal zones according to their ecological preferences. However, although much information is available on the oceanic scale distribution of coccolithophores, the environmental parameters that control the distribution of them are still poorly understood. This reflects, in part, a shortage of suitable studies on natural populations. The basic understanding of modern ecological affinities of the species is, however, essential for paleoecological studies using coccolith assemblages as proxies in the geological record.

Acantharia are planktonic organisms whose skeletons consists of celestite (SrSO_4). Bernstein et al. (1992) proposed that the dissolution of acantharian-derived celestite which contains considerable amounts of barium ($\text{BaSO}_4/\text{SrSO}_4$ ratios in the order of 0.003) represents one of the major sources of productivity-related barium or barite. However, due to the fragile nature of these organisms and their susceptibility to rapid disintegration and dissolution of the celestite spines in the water column a clear relationship between the abundance and downward flux of acantharia and so-called "biogenic" or "marine" barite has not yet been established.

5.1 Water column characteristics

(Karin Zonneveld)

Positions and timing of the performed CTD casts are given in Figures 10 - 25 and Table 3.

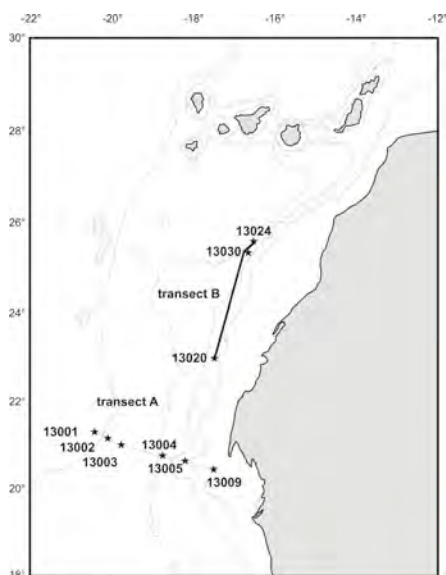


Figure 10. Transekt A and B on Leg P366-1

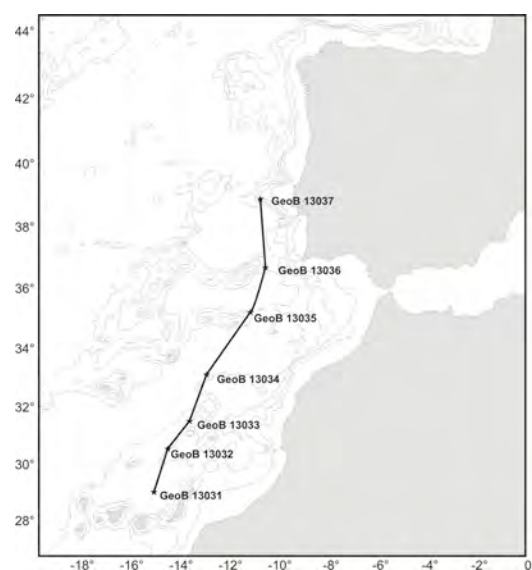


Figure 11. CTD transect on Leg P366-2.

The surface water circulation of the research areas of legs P366-1 and P366-2 is predominantly determined by the southward flowing Canary Current that bends from the continental margin to the southwest at about 21°N.

In the study region south of the Canary Islands, a dominant feature of the region is the presence of coastal upwelling of cool and nutrient-rich subsurface water, which results in high bioproductivity on the shelf. The “primary upwelling” band is 20-30 km wide (e.g. Mittelstaedt 1991; Klein and Tomzack, 1994 and references therein). Further offshore a second upwelling band can occur along the shelf break. A dominant steering role of upwelling length and intensity are the trade winds that have an equatorward direction. Between 20°N and 24°N upwelling occurs throughout the year with maximum intensity during spring and autumn.

Subsurface waters in the southern region consist of South Atlantic Central Water (SACW) and North Atlantic Central Water (NACW). The SACW is transported poleward off Cape Blanc at depths between 200-400m whereas NACW follows the Canary Current equatorward at depths between 100 and 600m. The most intensive mixing of their waters takes place at a latitude of 22°N – 23°N. The SACW is characterized by high nutrient concentrations compared to the NACW. According to Hagen (2001) enhanced productivity off Cape Blanc occurs when SACW feeds the onshore transport of upwelled water. This occurs especially during winter and spring (Mittelstaedt 1991). Characteristic for this region are “giant filaments” of relatively cold, chlorophyll-rich surface water. These giant filaments persist throughout the year and can be observed as far as about 450 km offshore. The occurrence of these filaments is strongly related to the general upwelling pattern with maximal occurrences between about 20°30'N and 22°N. At the time of sample collection along transect A during cruise P366-1 a major band of upwelling-related high surface water productivity occurred along the coast of western Sahara and Mauretania. A giant filament of high productivity could be observed offshore at about 20°5' W (Fig 12).

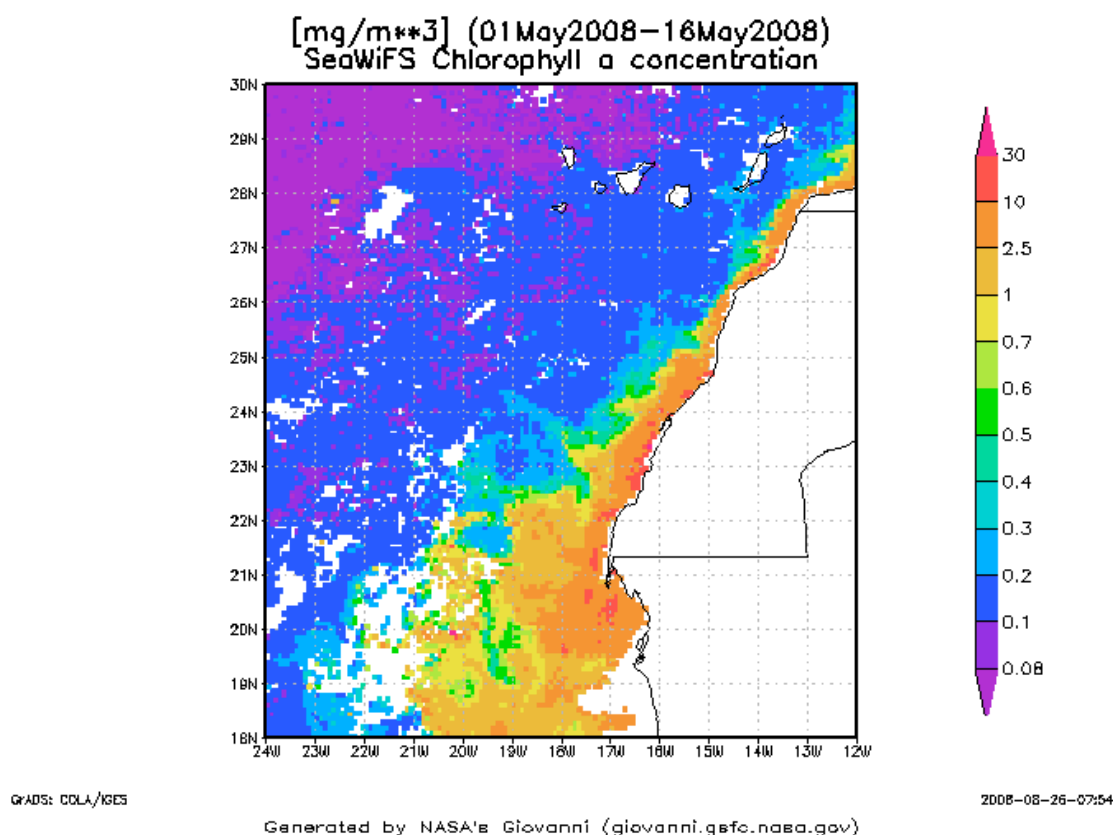


Figure 12. Compiled upper ocean chlorophyll-a concentrations registered by the Giovanni satellite between 01. May and 16 May 2008.

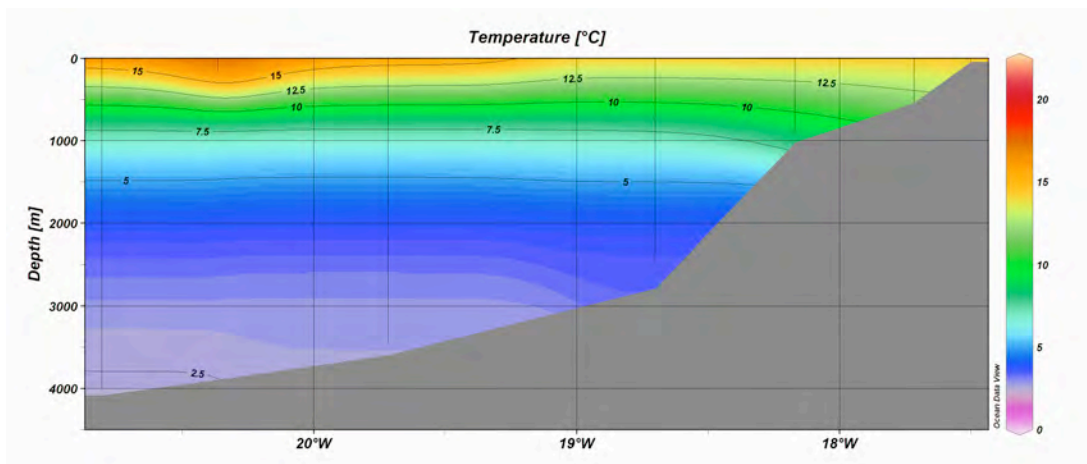


Figure 13. Cross section of the water column along transect A; temperature

Surface temperatures at transect A are relatively uniform with slightly lower temperatures on the shelf/slope of the Cape Blanc Region and at the most offshore site GeoB 13001. The relatively higher temperatures at about 20°5' W (GeoB 13002) reflect the central part of the giant filament which is also clearly reflected in the salinity profile (Fig. 14).

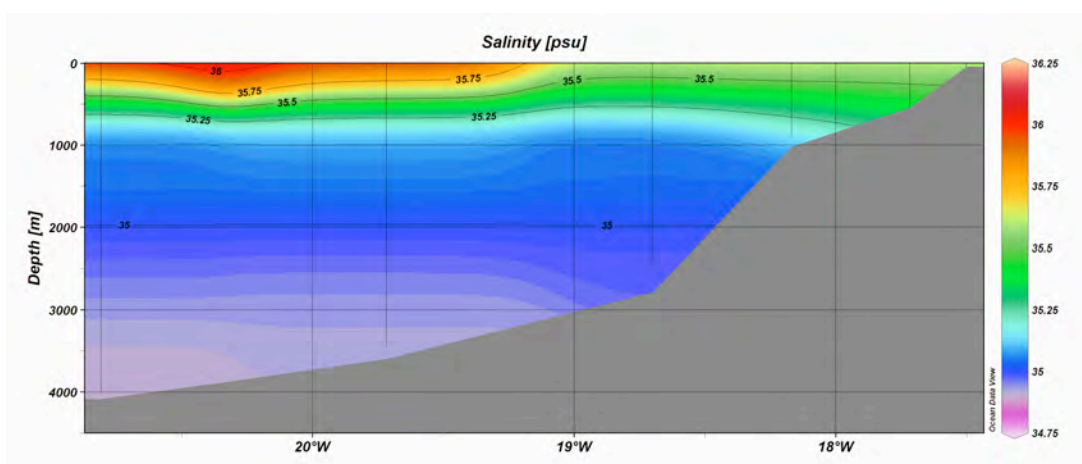


Figure 14. Cross section of the water column along transect A; salinity

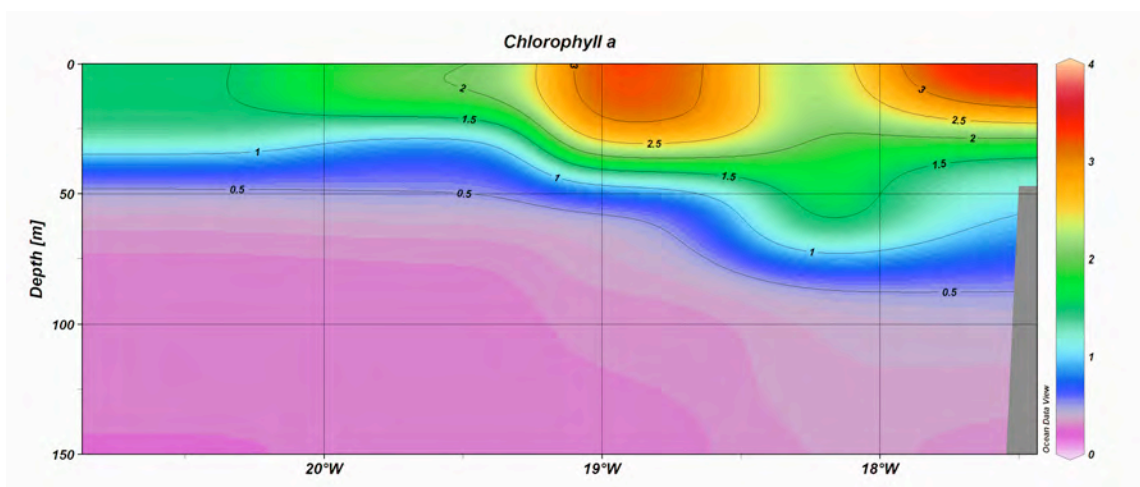


Figure 15. Cross section of the water column along transect A; chlorophyll-a.

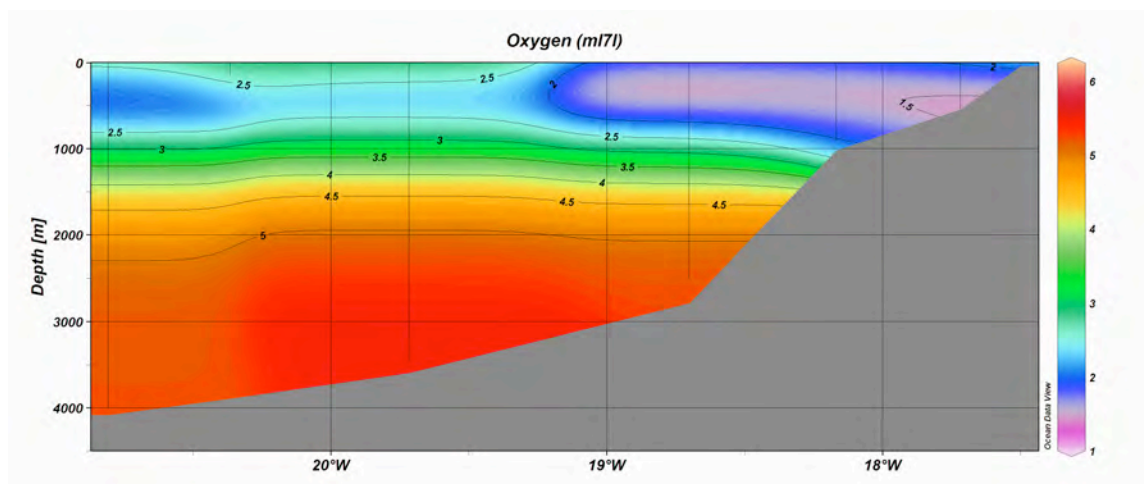
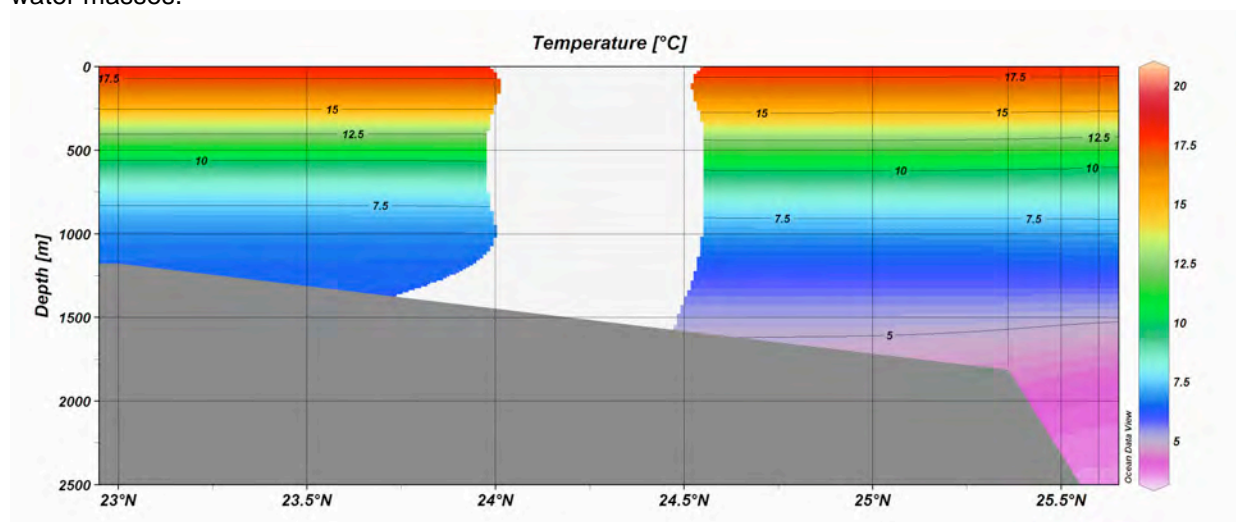


Figure 16. Cross section of the water column along transect A; oxygen

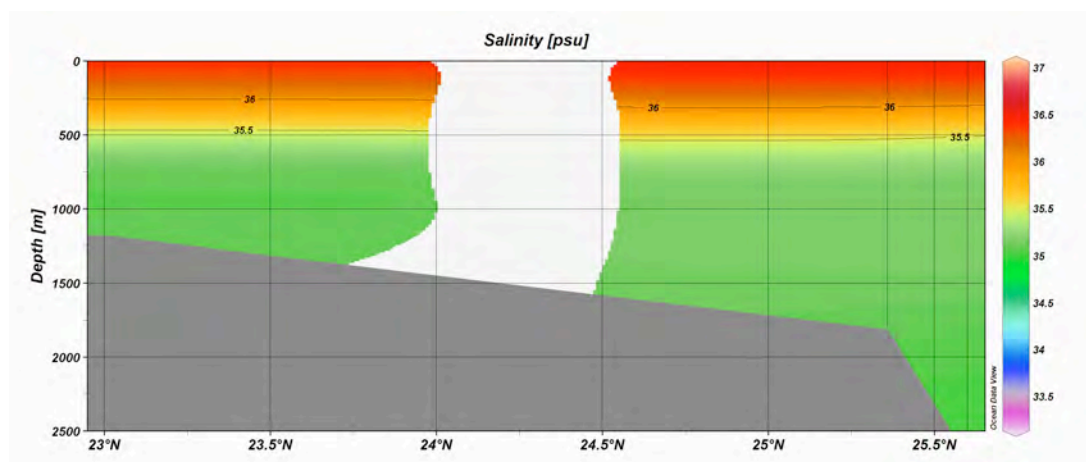
Chlorophyll-a concentrations depict two bands of enhanced productivity on the shelf-break and slightly offshore (Fig. 15). Relatively cold, lower saline conditions at these sites suggest that these high productivity bands are related to upwelling.

Oxygen concentrations at subsurface waters are low in the vicinity of the high productivity cells and at the most offshore site underlying the most distal part of the giant filament.

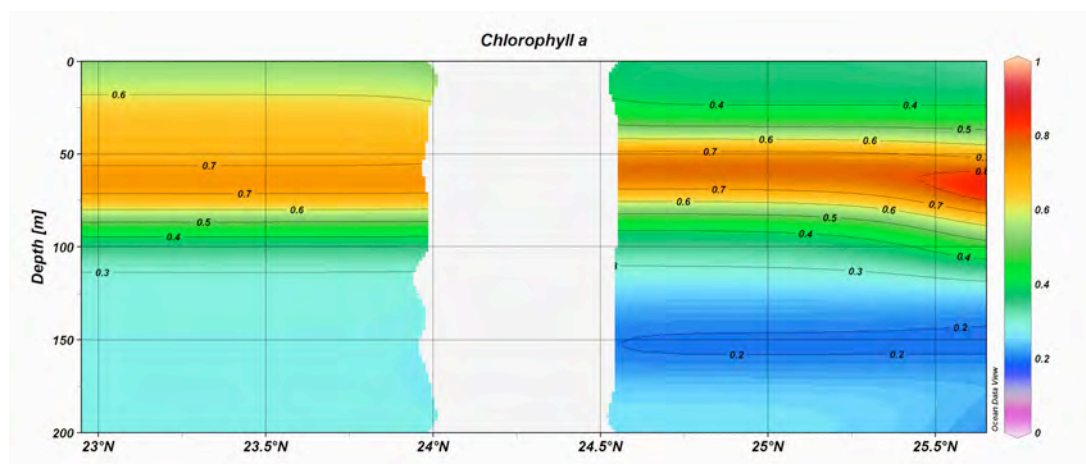
Surface water temperature and salinity are relatively higher along transect B compared to transect A. Subsurface waters are characterized by low oxygen concentrations and a clear deep chlorophyll maximum can be observed at about 50m depth (Figs. 17-19). Intermediate waters between about 100m and 1000m water depth are characterized by lower oxygen concentrations compared to surface and deep water masses.



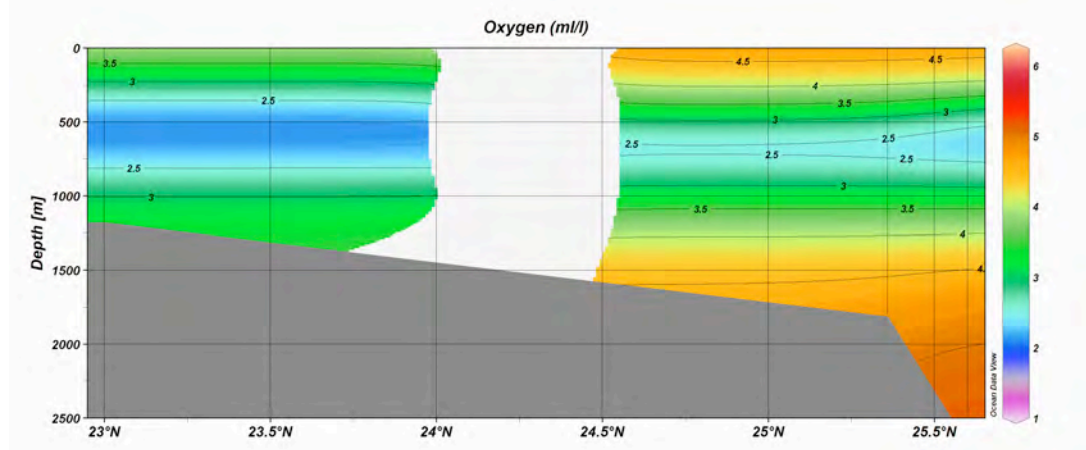
Figures 17. Cross section of the water column along transect B; temperature.



Figures 18. Cross section of the water column along transect B; salinity



Figures 19. Cross section of the water column along transect B; chlorophyll-a.



Figures 19. Cross section of the water column along transect B; oxygen.

Off the Iberian peninsula, in summer the Canary Current transports relatively cold surface waters to the south which originate from upwelling of subsurface waters under the influence of northeasterly trade winds. In winter a westerly atmospheric circulation prevails resulting in a reversal in the direction of the nearshore current along the Iberian peninsula. Subsurface and deep waters are formed by southward flowing Atlantic Intermediate Water and North Atlantic Deep Water. At subsurface depth off the Iberian peninsula a northern branch of the northward flowing relatively warm but salty Mediterranean Outflow Water can be observed.

Surface water along the south to north transect between stations GeoB 13031 and GeoB 13037 decreased in temperature from 20.8°C in the south to 17.4°C off Galicia. Temperatures decrease with depth. In the northern-most stations (GeoB 13036 and 1303) traces of the relatively warm (~12°C) Mediterranean Outflow water can be observed at intermediate water depths.

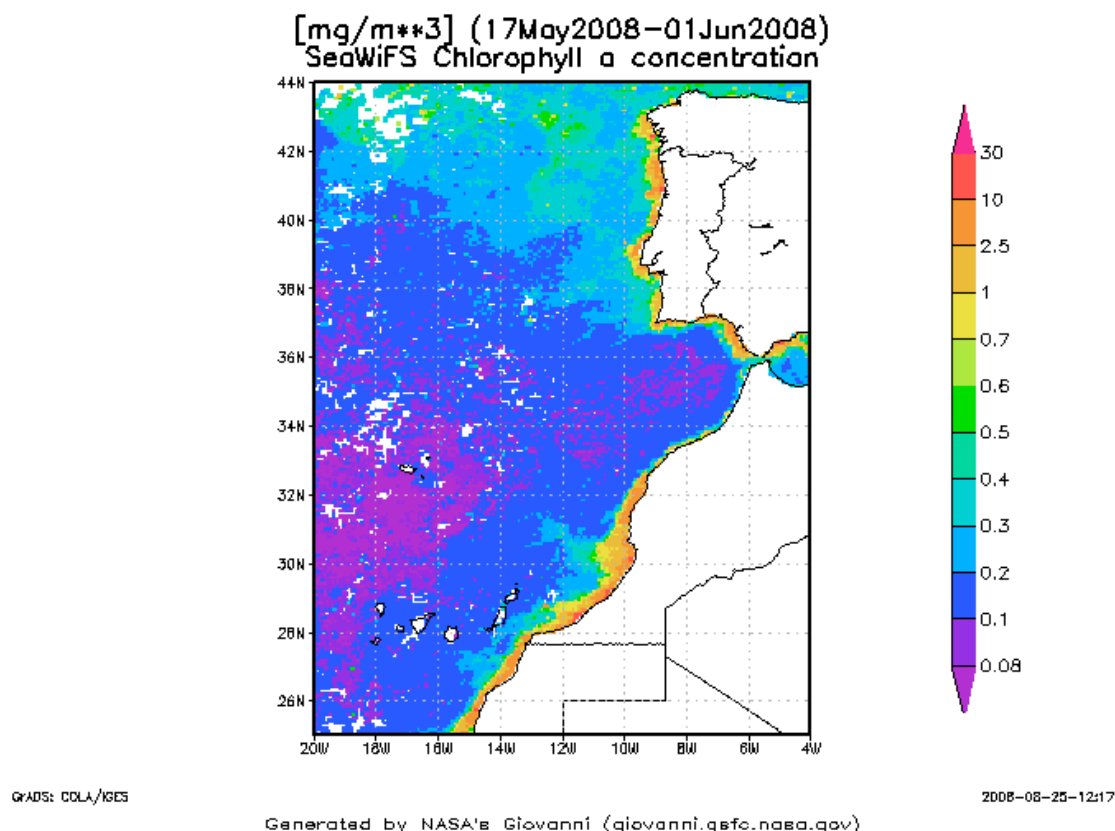


Figure 21. Upper ocean chlorophyll-a concentrations during sampling of P366-2

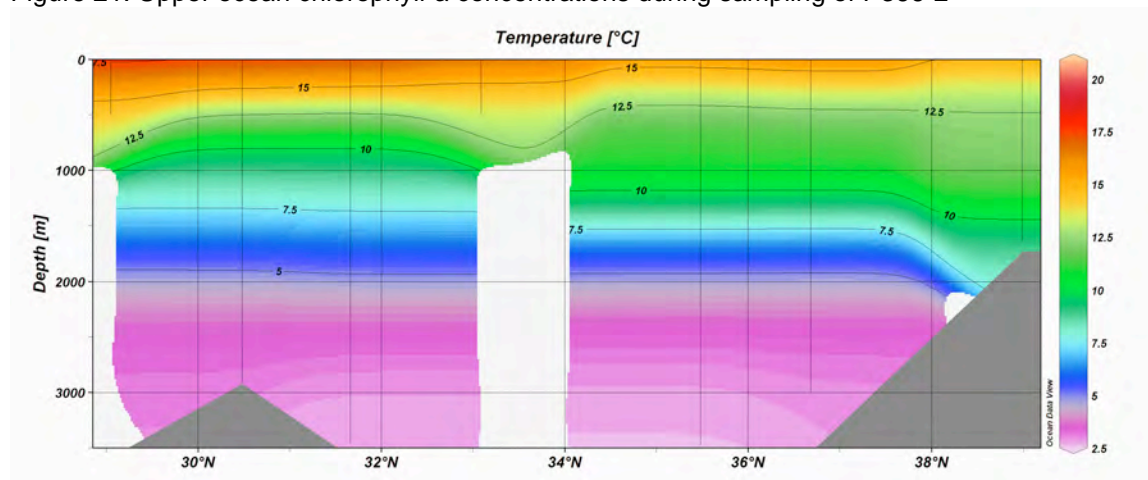


Figure 22. Cross section of the water column along transect P366-2; temperature.

Surface water salinity values are more or less similar in the whole research area. In the northern-most stations traces of the high saline Mediterranean Outflow Water can be observed at intermediate waters depths between about 500 m and 1500 m.

Oxygen concentrations are high in upper, deep and bottom waters. Intermediate waters are characterised by lower oxygen concentrations with minimum concentrations of 3.5 ml/l around 900 m depth.

Surface waters along the whole transect are characterised by relatively low chlorophyll-a concentrations. A deep chlorophyll maximum can be observed at subsurface depths between 50m and 100m water depth. Higher chlorophyll concentrations can be observed at the northern-most site GeoB 13037 positioned off Portugal, probably as result of the higher nutrient input in this area by rivers and upwelling processes.

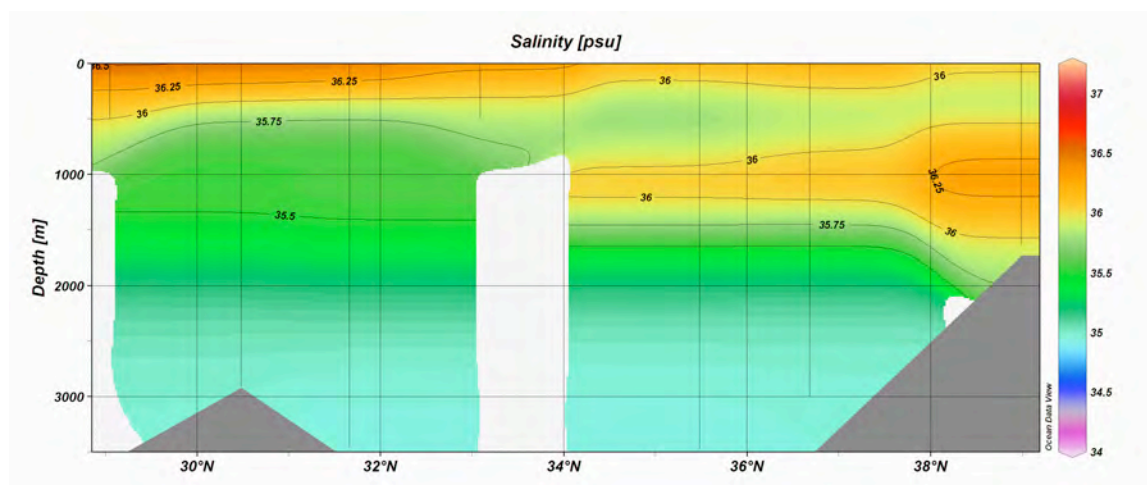


Figure 23. Cross section of the water column along transect P366-2; salinity.

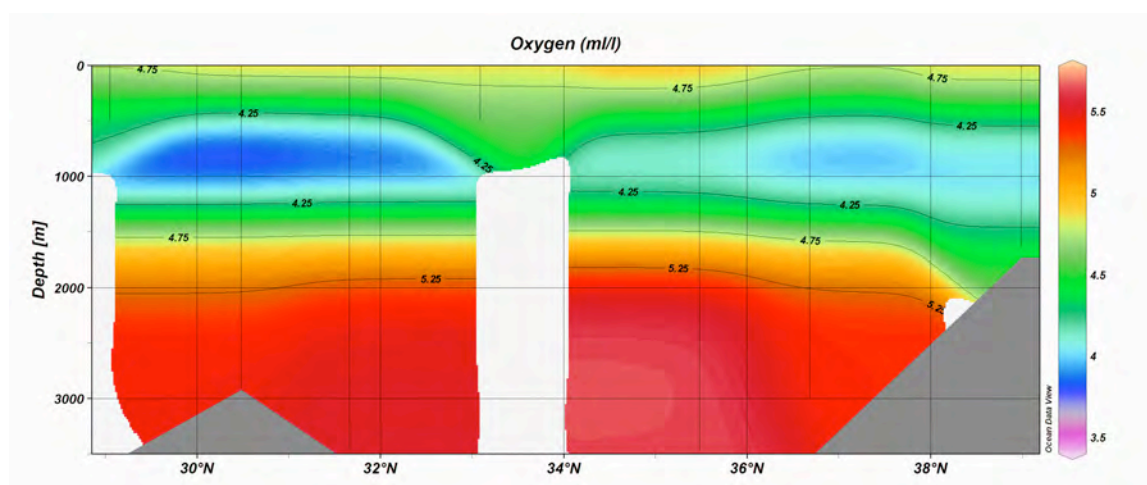


Figure 24. Cross section of the water column along transect P366-2; oxygen.

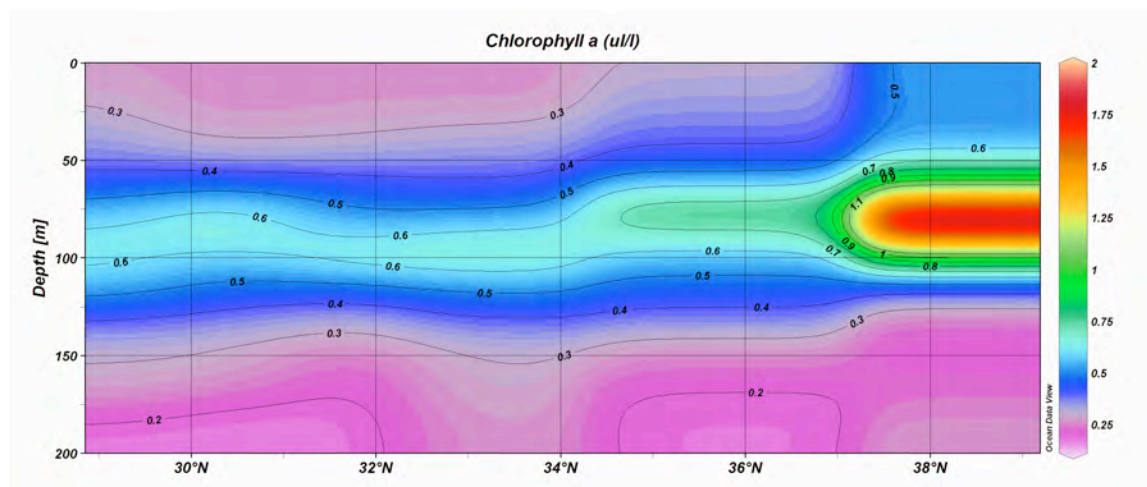


Figure 25. Cross section of the water column along transect P366-2; chlorophyll-a.

5.2 In situ-pump sampling

Janis Thal

In the scope of „EUROPROX Project III-9 Geochemistry - Terrigenous climate signals in deep-sea sediments: Assessment and quantification of alteration processes on primary signals" we used McLane© *in situ*-pumps (ISP) to sample particles from the water column. Previous investigations from this working area have revealed significant differences between the composition of terrestrial derived aeolian dust

samples and corresponding signals in surface sediments. Particles generally concentrate in layers at depths where different water masses meet called nepheloid layers. To identify and characterise possible alteration processes during the sinking of the particle load through the water column we sampled various water depths. We focussed on sampling the suspension-rich nepheloid layers. In lack of transmission-meter data, the sampling depths were presumed from CTD-data due to a significant change in salinity and temperature at pycnoclines.

Similar to the aerosol sampling the ISPs were equipped with three different kinds of filters. For inorganic compounds we used acetate/cellulose filters with a pore size of 0.2 μm , with a maximum flow rate of 3 L/min, and 0.45 μm with a maximum flow rate of 4 L/min. After sampling the filters were dried and packed in plastic bags and stored at 7 °C.

Glass fibre filters with a pore size of 0.45 μm with a maximum flow rate of 4 L/min were dried after sampling and packed in tempered aluminium foil and stored at -20°C.

The ISPs were used at several stations on the Cape Blanc Transect and in the working areas A and B during Leg P366-1 and along the south-north transect of Leg P366-2. Exact positions, sampling depths, filters used and volume of water pumped through the filters at all sampling sites are presented in Table 4.

5.3 Dinoflagellate cyst sampling

Karin Zonneveld

To obtain information about the depth habitat of the calcareous dinoflagellate cyst *Thoracosphaera heimii*, 20 to 40l of water has been collected at 4 to 6 positions in the upper 150m of the water column. Sample positions have been chosen based on the chlorophyll-a profiles of the upper 200m of the water column. Since previous investigations give strong suggestions that maximum abundances of this species can be expected just above the DCM (deep chlorophyll maximum) samples have been taken along a transect across the DCA. Samples have been sieved through sieves with pore diameters of 100 μm , 75 μm and 20 μm and successively filtered on a filter with 10 μm pores. The fraction between 10 and 20 μm has been dried at 60°C and stored in petri dishes for further analysis. At the depth of maximum cyst abundances an additional 180l of water has been sampled. 400ml has been stored for isotopic, elemental and chemical analysis. The remaining water was sieved oder vielleicht besser: filtered??? and stored by the method described above. Samples will be used for isotopic and elemental studies on the cysts walls (Table 3).

5.4 Plankton sampling for analysis of the coccolithophorid community at Leg P366-2

Karl-Heinz Baumann, Christina Fink

The uppermost water column was sampled at seven stations on a South to North transect in the eastern North Atlantic during leg P366/2 to study the species composition and the depth distribution of the coccolithophorid communities.

Water samples were taken from NISKIN-bottles of the rosette generally at 10m, 25m, 40m, 60m, 80m, 100m, 125m, 150m, 175m, and 200m of water depth (Table 3). In order to study the vertical distribution of the coccolithophores, 5l of sea water was filtered immediately onboard through cellulose nitrate filters (50 mm diameter, 0.45 μm pore size) by means of a water jet pump. Without washing, rinsing or chemical conservation the filters were dried at 40°C for at least 24h and stored in plastic Petri dishes. Studies of the distribution and composition of the coccolithophorid communities will be carried out on the filtered material using the Scanning Electron Microscope (SEM) at Bremen University. In addition, large volume water samples from one or two depths (25m and 70m or 80m) were taken from another Rosette cast or via In situ pumps (Table 3,4) on every station. These samples are taken to check for stable isotope and/or Sr/Ca elemental measurements.

5.5 Multinet Sampling

Markus Raitzsch

5.5.1. Plankton and Water Studies

The ratio between magnesium and calcium in shells of planktic foraminifera is predominantly dependent on the calcification temperature and therefore a widely used proxy for reconstructing past temperatures of surface and intermediate waters. However, in several studies it has been shown that apart from temperature other environmental factors may exert additional controls on the Mg incorporation into foraminiferal shells. The most important factors (besides temperature) are most likely salinity and the sea-water carbonate chemistry. In order to gain more insight into the link between shell Mg/Ca and the properties of ambient sea water, deep- and shallow-dwelling foraminifera have been collected with a multinet from different water depths between 500 m and the sea surface. From the same depths water samples for total inorganic carbon and alkalinity were taken that allow, together with CTD data, to calculate all other parameters of the carbonate system.

5.5.2. Plankton sampling

The plankton in the water column was sampled at 8 stations using a multinet with 5 nets (64- μ m-mesh width), which collected depth intervals of 500-250 m, 250-100 m, 100-50 m, 50-25 m, and 25-0 m for planktic foraminifer distribution (Table 5). All samples were conserved with 3 ml of saturated HgCl₂ solution and stored in the refrigerator at +4°C.

5.5.3. Water sampling

At 7 stations water samples were taken from 500 m, 250 m, 100 m, 50 m, 25 m, and 0 m depths with a CTD-rosette device (Tab. X) for the analysis of stable carbon and oxygen isotopes, total inorganic carbon, and alkalinity. The water samples were carefully filled into brown 30 ml glass bottles, avoiding air bubbles to minimize the exchange of CO₂ between water and air. The samples were always taken immediately after the sampler was opened to avoid degassing of CO₂ from the water. The carbon isotope and total inorganic carbon samples were poisoned with 0.5 ml of saturated HgCl₂ solution. After poisoning the samples were sealed airtight with melted paraffin.

6. Geological sampling and sedimentology

Inka Meyer, Jan-Berend Stuut, Julien Michel, Tim Haarmann, Sabine Kasten, Karin Zonneveld

Geological sampling was performed with a gravity corer and a multicorer. A gravity corer with a 5 m core barrel was used during leg P366/1. Gravity cores were cut in 1 m long segments on deck and sealed with plastic caps upon recovery. For pore water retrieval and geochemical sampling the 1-m segments were immediately transferred into the air-conditioned lab and processed within a few hours.

A multicorer was deployed to recover the sediment-water interface, the undisturbed sediment surface, and the overlying water. The device used during the cruises was equipped with six large and four small (10 and 6 cm inner diameter, respectively) 60 cm long plastic tubes. Some tubes were pre-drilled for pore-water analyses. However, at some stations these particular tubes were not filled with sediments and new holes had to be drilled in order to apply the rhizon technique. In general at each station the cores were shared amongst the different scientific disciplines for:

- Foraminifera studies, for which the upper 5 cm were stained with rose Bengal
- Geochemistry, pore water
- Geochemistry, solid phase
- Dinoflagellates (one large core completely frozen)
- Oxygen measurements (2 cores where available)
- Organic geochemistry

In addition, from all MUC cores the upper two centimetres were sampled for grain-size analyses.

The yield varied strongly during the cruises, so that not at all stations the cores could be distributed over the whole range of disciplines. The distribution of these cores is indicated in Table 6.

7. Van Veen grab sampling

Julien Michel

The scientific target of grab sampling of surface sediments during leg P366/1 was the characterization of high-nutrient carbonate sediments deposited on a tropical, open-shelf system.

A total of 18 grab sampling stations (Table 1) were run using the grab sampler (Figure 26). 13 samples were retrieved in the Golfe d'Arguin area (Mauritania; area C), three in the Western Sahara area (area B) and two in the Morocco area (area A). The samples were taken along transects perpendicular to the shelf break in water depths of 27 to 545 m. They were documented photographically and then sub-sampled (one ethanol sample, two bulk samples, one of the two was dried on board). The remaining bulk sediment was sieved with mesh widths of 1 mm and 2 mm.



Fig. 26: Van Veen grab used during leg P366/1.

The samples taken from the Golfe d'Arguin (example shown in figure 27) complement the data set realized during the Poseidon 346 cruise (December 2006/January 2007; Westphal et al. 2007). The samples retrieved from the shelves off the Western Sahara (Fig. 28) and Morocco will permit to compare the material with the sediment from the Mauritanian shelf. In particular, the biogenic carbonate production will be compared between the three different sites of the Northwest African upwelling area.



Fig. 27: Coarse fraction (>2mm) of grab sample GeoB 13017-1 from the northern-half of the Golfe d'Arguin, northern Mauritania (water depth of 36 m). The sediment is composed of carbonate sand. Main gravel components consist of bivalves (e.g. *Laevicardium crassum*, *Aequipecten* sp), gastropods (e.g. *Natica fulminea*, *Marginella* sp), worm tubes, sea urchin and bioclasts.

The surface sediments recovered will be studied in order to characterize the carbonate-secreting faunal assemblage which is produced under upwelling influence (facies description, taxonomy and isotopes; cf. Michel et al., subm.). The atypical tropical carbonate sediments present in the Golfe d'Arguin consist of a heterozoan association (*sensu* James, 1997) found in tropical latitudes not yet described in the literature. Our current study on Poseidon 346 samples complemented by samples of Poseidon leg P366/1 aims at filling this gap in order to provide an analogue for interpretations of ancient carbonate deposits.



Fig. 28: Bulk sediment of grab sample GeoB 13029-1 from the Western Saharan shelf (water depth of 49 m). The sediment is composed of carbonate sand which mainly consists of bivalve shells and bivalve fragments.

8. Geochemistry

8.1 Research objectives

The focus of geochemical investigations carried out during this cruise in the frame of EUROPROX project 8b was a detailed examination of the early diagenetic processes as well as the identification of the geochemical zonation in the sediments off Northwest Africa along the strong gradients in productivity and aeolian dust input. Particular emphasis was on the investigation of the preservation and early diagenetic overprint of a variety of proxy parameters (e.g. barite, iron minerals, organic carbon, calcium carbonate, etc.) under different environmental, depositional and paleoceanographic conditions. Furthermore, we aimed at studying which plankton organisms/particles are the main carriers of particulate barium – namely barite – in this ocean area profoundly influenced by the input of terrigenous material.

8.2. Methods of pore water sampling and analysis

To prevent a warming on deck all sediment and water samples were rapidly transferred into the air-conditioned labs on board the RV POSEIDON and immediately processed after recovery. Pore water was extracted by means of rhizon samplers (pore size 0.1 μm). At each site two multicorer cores were taken if possible for pore water extraction and solid-phase sampling. A sample of the supernatant bottom water was taken and filtered for subsequent analyses. The remaining bottom water was carefully removed from the multicorer by means of a siphon to avoid destruction of the sediment surface. During subsequent cutting of one of the parallel cores into slices for solid phase sampling, pH measurement was performed with a minimum depth resolution of 1 cm. At four stations an additional MUC core was utilized to perform oxygen measurements with a fiber optic oxygen sensor (FIBOX3) and a micromanipulator.

For sampling of the gravity cores holes were cut into the plastic liner of the 1-m segments with a vibro-saw at 20 cm depth resolution and the following samples/measurements were taken/performed: (1) 3 ml syringe samples of wet sediment for methane/hydrocarbon analyses (taken at 3 stations), (2) determination of pH by means of punch-in electrodes, (3) about 10 ml of wet sediment were taken and stored under argon for subsequent solid-phase analyses, and (4) pore water was retrieved by means of rhizon samplers.

Pore water analyses

Pore water analyses of the following parameters were carried out during this cruise: pH, alkalinity, and iron (Fe^{2+}):

The pH value was determined by means of a punch-in electrode. Alkalinity was calculated from a volumetric analysis by titration of 1 ml of pore water with 0.01 or 0.05 M HCl, respectively. For the analyses of dissolved iron (Fe^{2+}) sub-samples of 1 ml were taken directly from pore water extracted by rhizons, immediately complexed with 50 μl of “Ferrospectral” and determined photometrically.

For further analyses at the Alfred Wegener Institute for Polar and Marine Research (AWI) in Bremerhaven, aliquots of the remaining pore water samples were diluted 1:2 and stored frozen for ammonium analyses (conductivity method) as well as diluted 1:10 and acidified with HNO_3 (suprapure) for cation analyses (Ca, Mg, Sr, K, Ba, S, Mn, Si, B, Li) by ICP-AES and AAS. Additionally, 1.5 ml subsamples of the pore water were added to a ZnAc solution (600 μl) to fix all hydrogen sulfide present as ZnS for later analysis. Subsamples for sulfate and chloride determinations were diluted 1:100 and stored frozen for ion chromatography (HPLC). At three sites sediment samples taken from the gravity cores were transferred into 50 ml headspace vials filled with saturated NaCl solution and stored at 4°C until GC analyses for methane and higher hydrocarbons.

8.3. Shipboard results

During leg P366/1 6 gravity cores and 4 multicorer cores were sampled for pore water and solid phase geochemistry. All sites sampled geochemically, including parameters analysed on board as well as aliquots of pore-water and solid-phase samples taken and stored for further analyses at the AWI in Bremerhaven are listed in Table 7. Water column samples were retrieved at 17 stations by the rosette water sampler and plankton samples were taken with a hand net at 8 sites (Table 8). In addition, oxygen measurements in surface sediments were performed at 4 stations.

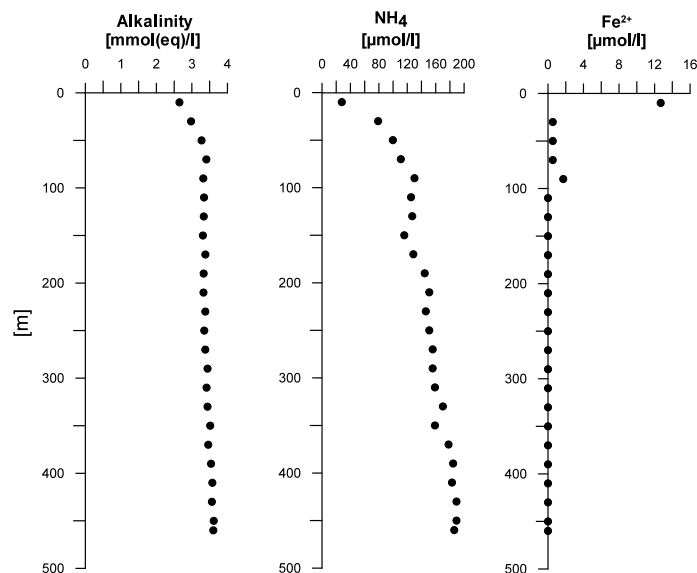


Fig. 29: Pore water concentration profiles of gravity core GeoB 13005-5.

Figures 29 and 30 depict pore water concentration profiles obtained for sites GeoB 13005 and GeoB 13020. Core GeoB 13005-5 (Fig. 30) was recovered off Cape Blanc at a water depth of 1046 m and shows significantly higher alkalinity and ammonium values than core GeoB 13020-4 (1170 m water depth; Fig. 30) which was retrieved north of Cape Blanc in an area characterized by lower surface water productivity. For both sites dissolved Fe^{2+} was determined in the upper 50 to 100 cm which is indication of ongoing iron reduction in these surface sediments. Fe^{2+} concentrations are higher at site GeoB 13020 compared to site GeoB 13005 which is most likely a result of higher input of iron oxides at the northern site and/or higher rates of sulfate reduction at the Cape Blanc location.

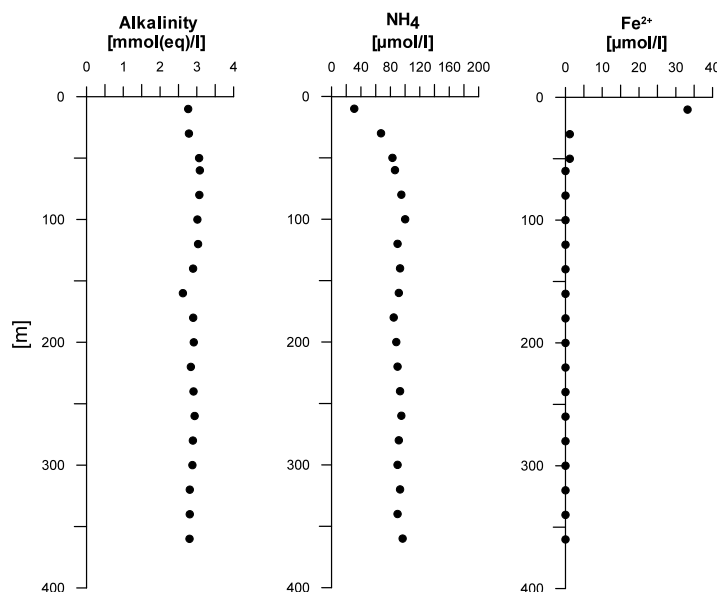


Fig. 30: Pore water concentration profiles of gravity core GeoB 13020-4.

Oxygen measurements have been performed with a fiber optic oxygen sensor (FIBOX3) using a micromanipulator. Oxygen concentrations were completely depleted within the upper mm of the sediment within the OMZ that exists on the Mauretanian shelf. Within the suboxic zone in the lower part of the OMZ at the outer shelf, oxygen penetrates until about 7 cm. Oxygen penetration reaches about 40 mm within cores GeoB 13004 and GeoB 13037 where bottom waters are well oxygenated.

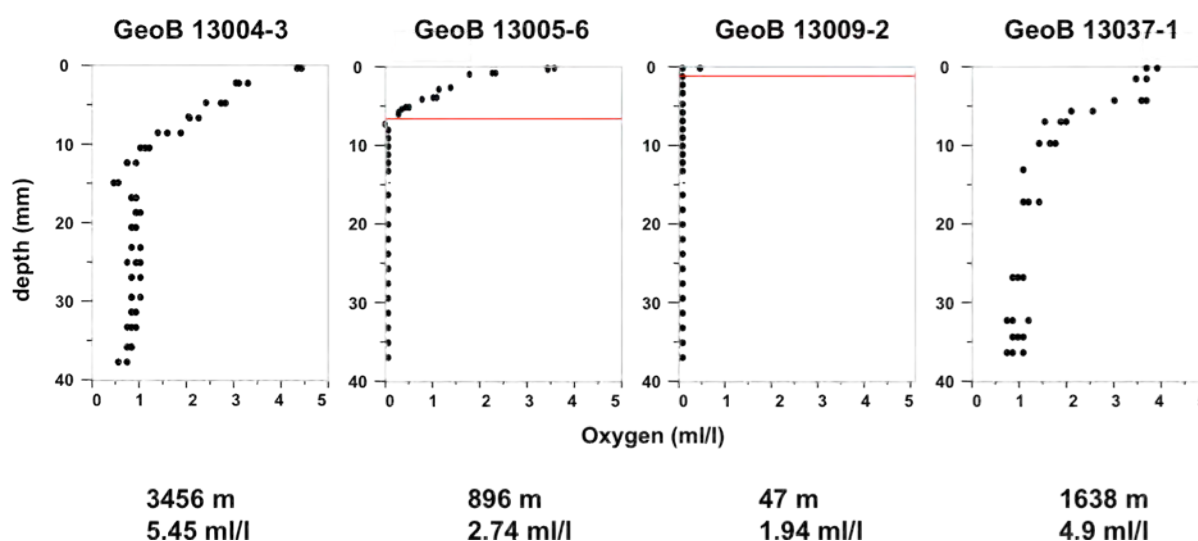


Figure 31. Pore water oxygen concentrations.

Cited References

- Bernstein R.E., Byrne R.H., Betzer P.R. and Greco A.M. (1992). Morphologies and transformation of celestite in seawater: the role of acantharians in strontium and barium geochemistry. *Geochim. Cosmochim. Acta*, 56:3273-3279.
- Bernstein R.E. & Byrne R.H. (2004). Acantharians and marine barite. *Mar. Chem.*, 86:45-50.
- Benech, C. and Marmet, E.: (1999). 'Optimum depth of investigation and conductivity response rejection of the different electromagnetic devices measuring apparent magnetic susceptibility', *Archaeol. Prospect.* 6, p. 31-45.
- Cowie G.L., Hedges, J.I. Prahl, F.G. and de Lange G.J. (1995). Elemental and major biochemical changes across an oxidation front in a relict turbidite: an oxygen effect. *Geochim. Cosmochim. Acta*, 59:33-46.
- Dale A.L. and Dale B. (1992). Dinoflagellate contributions to the open ocean sediment flux. In: Dale B. and Dale A.L. (Eds.) *Dinoflagellate Contributions to the Deep Sea*, 45-73 pp.
- Dauwe B., Middelburg J.J. and Herman P.M.J. (2001). Effect of oxygen on the degradability of organic matter in subtidal and intertidal sediments of the North Sea area. *Mar. Ecol. Prog. Ser.*, 215:13-22.
- de Lange G. J. (1998). Oxidic vs. anoxic diagenetic alteration of turbiditic sediments in the Madeira Abyssal Plain, Eastern North Atlantic. In: Weaver P.P.E., Schmincke H.-U., Firth J.V. and Duffield W. (Eds.), *Proc. ODP, Sci. Res.*, 157:573-580.
- Dickens G.R., Fewless T., Thomas E. and Bralower T.J. (2003). Excess barite accumulation during the Paleocene/Eocene thermal maximum: Massive input of dissolved barium from seafloor gas hydrate reservoirs.- Causes and Consequences of Globally Warm Climates in the Early Paleogene, *Geol. Soc. Am. Spec. Publ.*, 369:11-23.
- Dymond J., Suess E. and Lyle M. (1992). Barium in deep-sea sediment: A geochemical proxy for paleoproductivity. *Paleoceanography*, 7:163-181.
- Eglinton T.I., Conte M.H., Eglinton G and Hayes J.M. (2001). Proceedings of a workshop on alkenone-based paleoceanographic indicators. *Geochem., Geophys., Geosys.*, 2:2000GC000122.
- Francois, R., Honjo S., Manganini S.J. and Ravizza G.E. (1995). Biogenic barium fluxes to the deepsea: implications for paleoproductivity reconstructions. *Global Biogeochem. Cycles*, 9:289-303.
- Friedrich, O. & Meier, K.J.S. (2003). Stable isotopic indication for the cyst formation depth of Campanian/Maastrichtian calcareous dinoflagellates. *Micropaleontology*, 49:375-380.
- Ganeshram, R.S., Franc, R., Commeau, J. and Brown-Leger, S.L. (2003). An experimental investigation of barite formation in seawater. *Geochim. Cosmochim. Acta*, 67:2599-2605.
- Godhe, A., Norén, F., Kulenstierna, M., Ekberg, C. and Karlson, B. (2001). Relationship between planktonic dinoflagellate abundance, cysts recovered in sediment traps and environmental factors in the Gullmar Fjord, Sweden. *J. Plankton Res.*, 23:923-938.
- Hagino, K., Okada, H. and Matsuoka, H. (2000). Spatial dynamics of coccolithophore assemblages in the

- Equatorial Western-Central Pacific Ocean. *Mar. Micropal.*, 39:53-72.
- Harland, R. and Pudsey, C.J. (1999). Dinoflagellate cysts from sediment traps deployed in the Bellinghausen, Weddell and Scotia Seas, Antarctica. *Mar. Micropaleontol.*, 37:77-99.
- Hedges, J.I. and Prahl, F.G. (1993). Early diagenesis: consequences for applications of molecular biomarkers. In: Engel, M.H., Macko, S.A. and Jones, D.S. (Eds.). *Organic Geochemistry, Principles and Applications*, 237-253 pp.
- Hildebrand-Habel, T. and Willems, H. (2000). Distribution of calcareous dinoflagellates from the Maastrichtian to middle Eocene of the western South Atlantic Ocean. *Int. J. Earth Sci.*, 88:694-707.
- Hopkins, J.A. and McCarthy, F.M.G. (2002). Post-depositional palynomorph degradation in Quaternary shelf sediments: a laboratory experiment studying the effects of progressive oxidation. *Palynology*, 26:167-184.
- Inthorn, M., Wagner, T., Scheeder, G. and Zabel, M. (2006a). Lateral transport controls distribution, quality and burial of organic matter along continental slopes in high-productivity areas. *Geology*, 34:205-208.
- Karwath, B., Janofske, D. and Willems, H. (2000). Spatial distribution of the calcareous dinoflagellate *Thoracosphaera heimii* in the upper water column of the tropical and equatorial Atlantic. *Int. J. Earth Sci.*, 88:668-679.
- King A.L. and Howard W.R. (2003). Planktonic foraminiferal flux seasonality in Subantarctic sediment traps: A test for paleoclimate reconstructions. *Paleocean.*, 18:1019, 10.1029/2002PA000839.
- Kolber, Z.S., Barber, R.T., Coale, K.H., Fitzwater, S.E., Greene, R.M., Johnson, K.S., Lindley, S. and Falkowski, P.G. (1994). Iron limitation of phytoplankton photosynthesis in the equatorial Pacific Ocean. *Nature*, 371:145-148.
- Lea, D.W. (1999). Trace elements in foraminiferal calcite. In: Sen Gupta, B.K. (Ed) *Modern foraminifera*, Dordrecht, 259-277 pp.
- Malmgren, B.A., Kucera, M., Nyberg, J. and Waelbroeck, C. (2001). Comparison of statistical and artificial neural network techniques for estimating past sea surface temperatures from planktonic foraminifer census data. *Paleoceanography*, 16:520-530.
- Michel, J., Mateu-Vicens, G., Westphal, H. (subm.) Modern heterozoan carbonate facies from a eutrophic tropical shelf (Mauritania). To *Sedimentology*.
- Minor, E.C., Wakeham, S.G. and Lee, C. (2003). Changes in the molecular-level characteristics of sinking marine particles with water column depth. *Geochim. Cosmochim. Acta*, 67: 4277-4288.
- Mollenhauer, G., Eglinton, T.I., Ohkouchi, N., Schneider, R.R., Müller, P.J., Grootes, P.M. and Rullkötter, J. (2003). Asynchronous alkenone and foraminifera records from the Benguela Upwelling System. *Geochim. Cosmochim. Acta*, 67: 2157-2171.
- Mollenhauer, G., Inthorn, M., Zabel, M., Sinninghe Damsté, J. S., Eglinton, T.I. (2006). Cross-shelf Lateral Transport in the Benguela Upwelling System: Aging of Marine Organic Matter in the Benthic Boundary Layer. *AGU Ocean Sciences Meeting, Honolulu, OS42B-01*.
- Morquecho, L. and Lechuga-Devéze C.H. (2004). Seasonal occurrence of planktonic dinoflagellates and cyst production in relationship to environmental variables in subtropical Bahía Concepción, Gulf of California. *Bot. Mar.*, 47:313-322.
- Murray, J.W. (1991). Ecology and distribution of planktonic foraminifera. In: Lee J.J. and Anderson O.R. (Eds.), *Biology of foraminifera*. Acad. Press Harcourt, 255-284 pp. Neuer, S., Alfke, R., Bergenthal, M., Bittkau, A., Böhme, L., Bothmer, H., Cianca, A., Diekamp, V., Freudenthal, T., Gerdes, A., Godoy, J., Grimm, G., Hayn, C., Hebbeln, D., Huebner, H., Kahl, G., Klein, T., Köster, J., Laglera, L., Langer, J., Lenz, B., Meggers, H., Meinecke, G., Metzler, W., Moroto, L., Nave, S., Ochsenhirt, W., Ratmeyer, V., Rosiak, U., Rueda, M.-J., Ruhland, G., Schiebel, R., Schüssler, U., Struck, U., Themann, S., Villagarcia, M., von Oppen, C., and Waldmann, C. (2000). Report and preliminary results of METEOR Cruise M45/5, Bremen - Las Palmas, October 1 - November 3, 1999. *Berichte FB Geowissensch. Univ. Bremen*, 163p.
- Orians, K.J. and Bruland, K.W. (1985). Dissolved aluminum in the central North Pacific. *Nature*, 316:427-429.
- Paytan, A., Mearon, S., Cobb, K. and Kastner, M. (2002). Origin of marine barite deposits: Sr and S isotope characterization. *Geology*, 30:747-750.
- Paytan, A., Martinez-Ruiz, F., Eagle, M., Ivy, A. and Wankel, S.D. (2004). Using sulfur isotopes to elucidate the origin of barite associated with high organic matter accumulation events in marine sediments. In: Amend J.P., Edwards K.J. and Lyons T.W. (Eds.) *Sulfur biogeochemistry – Past and Present*, Boulder Colorado, Geol. Soc. Amer. Special Paper, 379:151-160.
- Prahl, F.G., Cowie, G.L., de Lange, G.J. and Sparrow, M.A. (2003). Selective organic matter preservation in "burn-down" turbidites on the Madeira Abyssal Plain. *Paleoceanography*, 18:30-1.
- Riedinger, N., Pfeifer, K., Kasten, S., Garhing, J.F.L., Vogt, C. and Hensen, C. (2005). Diagenetic

- alteration of magnetic signals by anaerobic oxidation of methane related to a change in sedimentation rate. *Geochim. Cosmochim. Acta*, 69:4117-4126.
- Riedinger, N., Kasten, S., Gröger, J., Franke, C. and Pfeifer, K. (2006). Active and buried authigenic barite fronts in sediments from the eastern Cape Basin. *Earth Planet. Sci. Lett.*, 241:876-887.
- Schefuß, E., Schouten S. and Schneider R.R. (2005). Climatic controls on central African hydrology during the past 20,000 years. *Nature*, 437:1003-1006.
- Smayda, T.J. and Reynolds, C.S. (2003) Strategies of marine dinoflagellate survival and some rules of assembly. *J. Sea Res.*, 49:95-106.
- Sprengel, C., Baumann, K.-H., Henderiks, J., Henrich, R. and Neuer, S. (2002). Modern coccolithophore and carbonate sedimentation along a productivity gradient in the Canary Islands region: seasonal export production and surface accumulation rates. *Deep-Sea Res. II.*, 49(17):3577-3598.
- Stuut, J.-B.W., Prins, M.A., Schneider R.R., Weltje G.J., Jansen J.H.F. and Postma G. (2002). A 300- kyr record of aridity and wind strength in southwestern Africa: inferences from grain-size distributions of sediments on Walvis Ridge, SE Atlantic. *Mar. Geol.*, 180:221-233. - VIII -
- Thierstein, H.R. and Young, J.R. (2004). *Coccolithophores – from molecular processes to global impact*. Springer-Verlag Berlin, Heidelberg, 565 p.
- Torres, M.E., Brumsack, H.J., Bohrmann, G. and Emeis, K.C. (1996). Barite fronts in continental margin sediments: A new look at barium remobilization in the zone of sulfate reduction and formation of heavy barites in diagenetic fronts. *Chem. Geol.*, 127:125-139.
- Versteegh, G.J.M. and Zonneveld, K.A.F. (2002). Use of selective degradation to separate preservation from productivity. *Geology*, 30:615-618.
- Vink, A. (2004). Calcareous dinoflagellate cysts in South and equatorial Atlantic surface sediments: diversity, distribution, ecology and potential for palaeoenvironmental reconstruction. *Mar. Micropal.*, 50:43-88.
- Wagner, T., Zabel, M., Dupont, L., Freudenthal, T., Holtvoeth, J. and Schubert, C. (2004). Terrigenous signals in sediments of the low latitude Atlantic – implications to environmental variations during the late Quaternary: Part I: The organic carbon.- In: Wefer, G., Mulitza, S. and Ratmeyer, V. (eds) *The South Atlantic in the Late Quaternary: Reconstruction of Mass Budget and Current Systems*, Springer, Berlin, Heidelberg, New York, 295-322 pp.
- Wakeham, S.G., Lee, C., Hedges, J.I., Hernes, P.J., Peterson, M.J. (1997). Molecular indicators of diagenetic status in marine organic matter. *Geochim. Cosmochim. Acta*, 61:5363-5369.
- Westphal, H. and cruise participants (2007) Report and preliminary results of Poseidon cruise 346, MACUMA. Las Palmas (Spain) – Las Palmas (Spain), 28.12.2006-15.1.2007. Berichte, Fachbereich Geowissenschaften, Universität Bremen, No. 260, 49 p
- Wilke, I., Peeters, F.J.C. and Bickert, T. (2006). The influence of seawater carbonate ion concentration on the stable carbon isotope composition of planktic foraminifera species *Globorotalia inflata*. *Mar. Micropal.*, 58:243-258.
- Zabel, M., Wagner, T. and DeMenocal, P. (2004). Terrigenous signals in sediments of the low latitude Atlantic – implications to environmental variations during the late Quaternary: Part II: The lithogenic matter. In: Wefer, G., Mulitza, S. and Ratmeyer, V. (Eds) *The South Atlantic in the Late Quaternary: Reconstruction of Mass Budget and Current Systems*, Springer, Berlin, Heidelberg, New York, 323-345 pp.
- Zonneveld, K.A.F., Versteegh, G.J.M. and de Lange, G.J. (1997). Preservation of organic walled dinoflagellate cysts in different oxygen regimes: a 10,000 years natural experiment. *Mar. Micropal.*, 29:393-405.
- Zonneveld, K.A.F., Versteegh, G.J.M., and de Lange, G.J. (2001). Palaeoproductivity and postdepositional aerobic organic matter decay reflected by dinoflagellate cyst assemblages of the Eastern Mediterranean S1 sapropel. *Marine. Geology*. 172:181-195.
- Zonneveld, K.A.F. (2004). Potential use of stable oxygen isotope composition of *Thoracosphaera heimii* for upper water column (thermocline) temperature reconstruction. *Mar. Micropal.*, 50:307-317.
- Zonneveld, K.A.F., Bockelmann, F. and Holzwarth, U. (2007a). Selective aerobic degradation of organic-walled dinoflagellates as tool to quantify past net primary production and bottom water oxygen concentrations. *Mar. Geol.*, 237:109 – 126.
- Zonneveld, K.A.F., Mackensen, A. and Baumann, K.-H. (2007b). Stable oxygen isotopes of *Thoracosphaera heimii* (Dinophyceae) in relationship to temperature; a culture experiment. *Mar. Micropal.*, 64:80–90.

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Table 1. Station list. Abbreviations used: ST: gravity corer, MUC: multicorer, SG: sediment grab, ROS+CTD: rosette water sampler + CTD, ISP: in-situ pumps, MN: multinet, PN: planktonnet.

Station GeoB No.	Station Ship No.	Date 2008	Device	Time [UTC] seafloor / maximum wire length	Latitude [N]	Longitude [W]	Water depth [m]	Samples / Core recovery	Remarks
13001-1	239	5.5.2008	ROS+CTD	12:15	21°16.50	20°48.33	4090		
13001-2	239-2		ISP	16:10	21°16.50	20°48.35	4158		
13001-3	239-3		MN	19:57	21°16.50	20°48.35	4025		to 500 m
13001-4	239-4	6.5.2008	ISP	05:10	21°16.50	20°48.34	4025		
13001-5	239-5		ISP	08:40	21°16.50	20°48.32	4025		
13001-6			HN						to 10 m
13001-7			HN						to 10 m
13002-1	240	6.5.2008	MUC	17:34	21°07.60	20°13.09	3920		No recovery
13002-2	241		MN	18:59	21°07.57	20°13.09	3963		to 500 m
13002-3	242	7.5.2008	ROS+CTD	05:07	21°07.62	20°13.13	3963		
13002-4	242-2		ROS+CTD	06:07	21°07.58	20°13.11	3963		
13002-5	242-3		MUC	08:32	21°07.60	20°13.10	4159	2/10	1 small, 1 large
13002-6	242-4		SL	11:40	21°07.62	20°13.09	4168		No recovery
13002-7	242-5		HN	12:36	21°07.61	20°13.07	4168		to 10 m
13003-1	243	7.5.2008	ROS+CTD	16:58	20°59.99	19°43.00	4168		to 150 m
13003-2	244		ROS+CTD	17:44	21°00.01	19°43.01	4168		to 3550 m
13003-3	244-2		ISP	20:48	21°00.00	19°43.01	3690		
13003-4	244-3		ISP	23:55	21°00.00	19°43.00	3648		
13003-5	244-4	8.5.2008	SL	08:16	21°00.00	19°43.00	3648	566 cm	
13003-6	244-5		MUC	11:12	21°00.00	19°43.02	3848		No recovery
13003-7	244-6		MUC	13:50	21°00.02	19°43.01	3857	1/10	1 small
13003-8	244-7		MN	15:13	21°00.02	19°42.97	3648		to 00 m
13003-9	244-8		HN	15:15	21°00.04	19°42.97	3648		to 10 m
13003-10	244-9		HN	15:31	21°00.05	19°42.95	3648		to 10 m
13004-1	245	8.5.2008	ROS+CTD	23:21	20°44.52	18°42.01	NV		
13004-2	245-2	9.5.2008	ISP	01:54	20°44.50	18°41.97	NV		
13004-3	245-3		MUC	06:35	20°44.51	18°42.01	2703	7/10	4 small, 3 large tubes
13004-4	245-4		SL	08:39	20°44.50	18°42.01	2705	572 cm	
13004-5	245-5		ROS+CTD	09:38	20°44.39	18°42.01	2705		to 150 m
13004-6	245-6		ROS+CTD	10:21	20°44.40	18°42.04	2708		to 100 m
13004-7	245-7		MN	10:46	20°44.40	18°42.00	2705		to 500 m
13004-8	245-8		HN	10:49	20°44.40	18°42.00	2705		to 10 m
13004-9	245-9		HN	11:00	20°44.40	18°42.00	2705		to 10 m
13004-10	245-10		ISP	11:41	20°44.40	18°42.00	2705		

Table 1. cont. Station list.

Station GeoB No.	Station Ship No.	Date 2008	Device	Time [UTC] seafloor / maximum wire length	Latitude [N]	Longitude [W]	Water depth [m]	Samples / Core recovery	Remarks
13005-1	246	9.5.2008	ROS+CTD	18:41	20°36.40	18°10.10	1039		to 900 m
13005-2	246-2		ROS+CTD	20:00	20°36.39	18°10.11	1029		to 150 m
13005-3	246-3		ISP	21:03	20°36.40	18°10.11	1028		
13005-4	246-4	10.5.2008	ISP	00:52	20°36.39	18°10.11	1038		
13005-5	246-5		SL	06:12	20°36.53	18°10.14	1046	482 cm	
13005-6	246-6		MUC	07:41	20°36.40	18°10.13	1040	6/10	3 small, 3 large
13005-7	246-7		CTD	08:20	20°36.34	18°10.11	1047		
13005-8	246-8		ISP	09:04	20°36.29	18°10.07	1033		
13005-9	246-9		ISP	12:37	20°36.31	18°10.09	1038		
13005-10	246-10		MN	14:21	20°36.31	18°10.08	1037		
13005-11	246-11		HN	14:37	20°36.30	18°10.08	1037		to 10 m
13005-12	246-12		HN	14:44	20°36.32	18°10.09	1037		
13006-1	247	11.5.2008	SL	07:17	19°40.00	16°55.04	29.4	~500 cm	
13006-2	247-2		SL	07:56	19°40.00	16°55.00	28	~500 cm	
13006-3	247-3		HN	08:15	19°40.18	16°55.08	28.6		to 10 m
13006-4	247-4		HN	08:27	19°40.13	16°55.16	29.6		to 10 m
13007-1	248	11.5.2008	SG	12:49	20°00.01	17°21.98	40		
13008-1	249	11.5.2008	SG	15:00	20°15.00	17°25.00	40		
13009-1	250	11.5.2008	ROS+CTD	15:54	20°15.00	17°29.99	47		
13009-2	250-2		MUC	16:12	20°14.99	17°29.99	46.8	8/10	2 small, 6 large
13009-3	250-3		SG	16:27	20°14.98	17°29.99	46.8		
13010-1	253	11.5.2008	SG	17:24	20°14.99	17°35.01	80		
13011-1	254	11.5.2008	SG	18:02	20°14.99	17°36.99	287		
13012-1	255	11.5.2008	ROS+CTD	19:11	20°14.98	17°43.00	541		
13012-2	255-2	12.5.2008	MUC	06:40	20°15.00	17°42.99	544	3/10	1 small, 2 large
13012-3	255-3	11.5.2008	SG	20:10	20°15.00	17°43.00	545		
13013-1	256	11.5.2008	SG	23:29	20°33.00	17°47.99	348		
13014-1	257	12.5.2008	SG	00:49	20°34.96	17°42.98	178		
13015-1	258	12.5.2008	SG	02:20	20°32.99	17°31.98	125		

Table 1. cont. Station list.

Station GeoB No.	Station Ship No.	Date 2008	Device	Time [UTC] seafloor / maximum wire length	Latitude [N]	Longitude [W]	Water depth [m]	Samples / Core recovery	Remarks
13016-1	259	12.5.2008	SG	11:01	20°33.00	17°24.00	49		
13017-1	260	12.5.2008	SG	12:01	20°33.00	17°16.99	36		
13018-1	261	12.5.2008	SG	13:27	20°42.00	17°14.98	37		
13019-1	262	12.5.2008	SG	14:26	20°42.00	17°21.49	53		
13020-1	263	13.5.2008	ROS+CTD	12:07	23°00.01	17°30.00	1175		
13020-2	263-2		MUC	13:38	23°00.01	17°29.99	1175		no recovery
13020-3	263-3		MUC	14:29	23°00.01	17°29.98	1175		no recovery
13020-4	263-4		SL	15:30	23°00.01	17°30.01	1170	370 cm	
13020-5	263-5		ROS+CTD	16:00	22°59.96	17°30.07	1172		
13020-6	263-6		MN	16:49	22°59.95	17°30.06	1172		to 500 m
13020-7	263-7		HN	16:53	22°59.94	17°30.06	1172		to 10 m
13020-8	263-8		HN	17:04	22°59.94	17°30.06	1172		to 10 m
13020-9	263-9		ISP	17:45	22°59.97	17°30.05	1172		
13020-10	263-10		ISP	21:23	23°00.00	17°30.00	1169		
13020-11	263-11		ISP	23:42	23°00.00	17°30.00	1170		
13021-1	264	14.5.2008	MUC	07:06	22°59.99	17°03.79	105	8/10	3 small, 5 large
13021-2	264-2		SG	07:18	22°59.99	17°03.75	105		
13022-1	265	14.5.2008	SG	09:17	23°00.01	16°50.25	47		
13023-1	266	14.5.2008	SG	11:35	22°59.97	16°31.33	27		
13024-1	267	15.5.2008	MUC	08:00	25°36.00	16°29.57	2679	2/10	2 large
13024-2	267-2		MUC	10:54	25°36.00	16°29.46	2672		no recovery
13024-3	267-3		SL	11:53	25°36.00	16°29.50	2674	400 cm	
13024-4	267-4		ROS+CTD	12:49	25°36.08	16°29.46	2675		to 2500 m
13024-5	267-5		ROS+CTD	15:15	25°36.07	16°29.43	2673		to 150 m
13024-6	267-6		ROS+CTD	15:53	25°36.07	16°29.45	2675		to 100 m
13024-7	267-7		MN	16:18	25°36.07	16°29.44	2674		to 500 m
13024-8	267-8		HN	16:21	25°36.07	16°29.43	2674		to 10 m
13024-9	267-9		HN	16:30	25°36.06	16°29.43	2673		to 10 m
13024-10	267-10		ISP	17:40	25°36.03	16°29.48	2674		
13024-11	267-11		ISP	21:38	25°35.98	16°29.50	2673		
13024-12	267-12		ISP	23:42	25°36.00	16°29.50	2674		

Table 1. cont. Station list.

Station GeoB No.	Station Ship No.	Date 2008	Device	Time [UTC] seafloor / maximum wire length	Latitude [N]	Longitude [W]	Water depth [m]	Samples / Core recovery	Remarks
13025-1	268	16.05.08	SL	06:20	25°26.00	16°17.00	1081	37 cm	very hard sediment
13025-2	268-2		SL	07:25	25°25.93	16°16.98	1066	31 cm	very hard sediment
13026-1	269	16.5.2008	SL	08:48	25°24.06	16°14.08	792		no recovery
13027-1	270	16.5.2008	SL	09:56	25°21.70	16°10.53	494		no recovery
13028-1	271	16.5.2008	SG	12:06	25°12.40	15°56.78	100		
13029-1	272	16.5.2008	SG	15:07	24°57.78	15°33.33	49		
13030-1	273	16.5.2008	ROS+CTD	21:59	25°21.61	16°32.29	1811		
13030-2	273-2		ROS+CTD	23:50	25°21.60	16°32.30	1812		
13030-3	273-3	17.5.2008	ROS+CTD	00:33	25°21.60	16°32.28	1811		
13030-4	273-4		MN	00:57	25°21.60	16°32.29	1811		
13030-5	273-5		ISP	01:43	25°21.60	16°32.28	1811		
13030-6	273-6		SL	07:30	25°21.61	16°32.30	1812	450 cm	
13030-7	273-7		MUC	09:04	25°21.61	16°32.30	1811	1/10	1 large
13030-8	273-8		ISP	10:00	25°21.71	16°32.32	1810		
13030-9	273-9		HN	12:11	25°21.72	16°32.31	1810		
13030-10	273-10		HN	12:20	25°21.71	16°32.33	1810		
13031-1	274-1	22.05.08	ROS+CTD	16:42	29°03.01	16°17.00	3591.0		to 500 m
13031-2	274-2		ROS+CTD	17:59	29°03.00	16°16.90	3591.0		to 150 m
13031-3	274-3		ROS+CTD	18:37	29°03.01	16°17.00	3591.0		to 100 m
13031-4	274-5		MN	19:40	29°03.02	16°16.99	3591.0		to 500 m
13031-5	274-6		ROS+CTD	20:34	29°03.00	16°17.00	3591.0		to 25 m
13032-1	275-1	23.05.08	ROS+CTD	08:27	30°29.44	14°29.21	2925.0		to 150 m
13032-2	275-2		ROS+CTD	11:03	30°29.04	14°29.16	2925.0		to 2899 m
13032-3	275-3		ROS+CTD	11:57	30°29.00	14°28.98	2925.0		to 150 m
13032-4	275-4		ROS+CTD	12:25	30°29.01	14°28.98	2923.0		to 50 m
13032-5	275-5		MUC	14:10	30°28.99	14°28.98	2923.0	1/10	
13032-6	275-6		MN	15:05	30°29.23	14°28.87	2923.0		to 500 m
13032-7	275-7		PN	05:03	30°29.23	14°28.87	2923.0		to 10 m
13032-8	275-8		ISP	18:40	30°29.23	14°28.87	2923.0		at 190 m - 120 m
13032-9	275-9		ISP	20:57	30°29.23	14°28.87	2923.0		at 190 m - 120 m

Table 1. cont. Station list.

Station GeoB No.	Station Ship No.	Date 2008	Device	Time [UTC] seafloor / maximum wire length	Latitude [N]	Longitude [W]	Water depth [m]	Samples / Core recovery	Remarks
13033-1	276-1	24.05.08	MUC	09:40	31°39.64	13°41.91	3585.0	1/10	
3033-2	276-2		ROS+CTD	10:20	31°39.99	13°41.75	3585.0		to 150 m
13033-3	276-3		ROS+CTD	13:13	31°39.98	13°41.73	3585.0		to 3480 m
13033-4	276-4		ROS+CTD	14:08	31°39.99	13°41.75	3585.0		to 120 m
13033-5	276-5		ROS+CTD	14:47	31°40.00	13°41.72	3585.0		to 25 m
13033-6	276-6		MN	15:45	31°39.99	13°41.75	3585.0		to 500 m
13033-7	276-7		PN		31°39.99	13°41.75	3585.0		to 10 m
13033-8	276-9		ISP	18:52	31°39.99	13°41.75	3585.0		at 250 m - 150 m
13033-9	276-10		ISP	21:33	31°39.99	13°41.75	3585.0		at 250 m - 150 m
13034-1	277-1	25.05.08	ROS+CTD	09:22	33°05.55	12°56.20	4500.0		to 200 m
13034-2	277-2		ROS+CTD	10:28	33°05.55	12°56.20	4500.0		to 500 m
13034-3	277-3		ROS+CTD	11:19	33°05.53	12°56.22	4500.0		to 150 m
13034-4	277-4		ROS+CTD	11:38	33°05.53	12°56.22	4500.0		to 25 m
13034-6	277-5		MN	12:21	33°05.54	12°56.22	4500.0		to 500 m
13034-7	277-6		PN	12:30	33°05.54	12°56.22	4500.0		to 10 m
13035-1	278-1	26.05.08	MUC	10:12	35°29.44	11°29.21	3744.0	1/10	
13035-2	278-2		ROS+CTD	10:55	35°29.04	11°29.16	3744.0		to 200 m
13035-3	278-3		ROS+CTD	13:30	35°29.00	11°28.98	3744.0		to 3411 m
13035-4	278-4		ROS+CTD	14:10	35°29.01	11°28.98	3744.0		to 150 m
13035-5	278-5		ROS+CTD	14:41	35°28.99	11°28.98	3744.0		to 25 m
13035-6	278-6		MN	15:51	35°29.23	11°28.87	3744.0		to 500 m
13035-7	278-7		PN	15:09	35°29.23	11°28.87	3744.0		to 10 m
13035-8	278-9		ISP	18:30	35°29.23	11°28.87	3744.0		at 160 m - 60 m
13035-9	278-10		ISP	21:40	35°29.23	11°28.87	3744.0		at 160 m - 60 m
13036-1	279-1	27.05.08	ROS+CTD	10:06	36°41.00	10°25.57	3544.0		to 200 m
13036-2	279-2		ROS+CTD	10:40	36°41.04	10°25.54	3544.0		to 67 m
13026-3	279-3		ROS+CTD	10:55	36°41.03	10°25.52	3544.0		to 3000 m
13036-4	279-4		ROS+CTD	13:29	36°41.06	10°25.49	3544.0		to 200 m
13036-5	279-5		MN	14:40	36°41.05	10°25.51	3544.0		to 500 m
13036-6	279-6		PN	13:56	36°41.04	10°25.51	3544.0		to 10 m
13036-7	279-8		ISP	17:30	36°41.05	10°25.51	3544.0		at 100 m - 200 m
13036-8	279-9		ISP	19:28	36°41.05	10°25.51	3544.0		at 25 m - 80 m
13037-1	280-1	28.05.08	MUC	12:43	38°59.02	10°31.50	1736.0	4/10	
13037-2	280-2		ROS+CTD	16:35	38°59.65	10°31.51	1736.0		to 200 m
13037-3	280-3		ROS+CTD		38°59.65	10°31.51	1691.0		to 1694 m
13037-4	280-4		ROS+CTD	19:19	39°00.39	10°31.32	1653.0		to 84 m
13037-5	280-5		ROS+CTD	13:12	38°59.48	10°31.64	1718.0		to 84 m
13037-8	280-6		ISP	23:45	38°59.48	10°31.64	1718.0		at 100 m - 30 m
13037-9	280-7		ISP	01:07	38°59.48	10°31.64	1718.0		at 70 m - 25 m

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